Thirteenth Annual

RESEARCH REPORT

North Central Weed Control Conference

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This report gives brief summaries of weed control studies conducted in 1956 in the north central states of the United States and in the four inland provinces of Canada. While many of the experiments reported on are not completed, it is hoped that these preliminary reports will be useful in providing leads for further research. This is especially true of results with new herbicides or new uses for established herbicides. This report is not intended to supplant full publication of research findings in established journals.

This Research Report has resulted from the cooperative efforts of all those who contributed abstracts and of the Research Committee who assembled the material, cut the stencils and submitted them promptly for mimeographing.

Robert E. Nylund
Chairman, Research Committee

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Soybeans- - - - - - - - - - - - F.W. Slife, Agronomy Department, University of Illinois, Urbana, Illinois

Forage Legumes- - - - - - - - - P.F. Sand, Agronomy Department, University of Nebraska, Lincoln 3, Nebraska

Herbaceous Weeds in Pastures and Meadows - M.K. McCarty, Field Crops Research Branch, U.S.D.A., and Agronomy Department, University of Nebraska, Lincoln 3, Nebraska

Sugar Beets - - - - - - - - - - E.A. Helgeson, Department of Botany, North Dakota Agricultural College, Fargo, North Dakota

Turf- - - - - - - - - - - - - - O.C. Lee, Department of Botany and Plant Pathology, Purdue University, West Lafayette, Indiana

Field and Canning Peas- - - - J.J. Sexsmith, Experimental Station, Lethbridge, Alberta, Canada

Onions, Potatoes, and Root Crops - E.K. Alban, Department of Horticulture, Ohio State University, Columbus 10, Ohio

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Flowers - - - - - - - - - - - - J.P. Mahlstede, Department of Horticulture, Iowa State College, Ames, Iowa

Fruits- - - - - - - - - - - - - D.D. Hemphill, Department of Horticulture, University of Missouri, Columbia, Missouri

Ornamental Nurseries, Forest Nurseries, Shelterbelts and all others -J.P. Mahlstede Department of Horticulture, Iowa State College, Ames, Iowa

Brush on Rangeland and Pastures - - H.M. Elwell, Field Crops Research Branch, U.S.D.A., and Oklahoma Agricultural Experiment Station, Box 465, Guthrie, Oklahoma

Brush on Rights-of-way- - - - R.H. Beatty, Agricultural Chemicals Division, American Chemical Paint Company, Ambler, Pennsylvania

Brush in Forests and Plantings - H.L. Hansen, School of Forestry, University of Minnesota, University Farm, St. Paul 1, Minnesota

Chemical Drying and Pre-harvest Weed Control - Neal Shafer, Department of Agronomy University of Nebraska, Lincoln 3, Nebraska

New Herbicides- - - - - - - - W.C. Dutton, 523 Bailey Street, East Lansing, Mich.

Mechanical Consideration and Aerial Applications - R.E. Larson, Agricultural Engineering Research Branch, U.S.D.A., and University of Missouri, Columbis, Missouri

Basic Studies in Botany, Ecology, and Plant Physiology - W.E. Loomis, Department of Botany and Plant Pathology, Iowa State College, Ames, Iowa

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CANADA THISTLE (Cirsium arvense) AND PERENNIAL SOW THISTLE (Sonchus arvensis)

Summary B. J. Rogers

The control of Canada thistle and perennial sow thistle received attention from investigators representing eight research centers. One institution supplied three abstracts and two supplied two apiece, making a total of twelve abstracts altogether. Ten of the reports were concerned only with Canada thistle and two covered both Canada and perennial sow thistle. Four of the abstracts referred to the use of amino triazole only, and six more included amino triazole and other chemicals, both applied individually and in combinations. The other chemicals used were polychlorobenzoics, 2,4-D, MH, MCP, CMU, and 2,4-D-butyrics. One of the abstracts reported the use of soil sterilants for Canada thistle control and another reported the use of 2,4-D and MCP for control of both Canada and perennial sow thistles.

Among the soil sterilants, sodium chlorate, concentrated borascu, and erbon gave good control over a period of one year, at least, at the rates used. A boron trioxide-2,4-D mixture was not too successful in one case. 2,4-D amine at 80 lbs/A gave 80% control.

Application of 2,4-D, MCP, 2,4-D butyric, and polychlorobenzoics to both Canada thistle and perennial sow thistle resulted in reduction of top growth, but apparently no lasting control. Combinations of these chemicals with amino triazole were not too effective.

Amino triazole was the most popular chemical used, and was reported, in the majority of cases, to give good control of Canada thistle. As was indicated last year, application of amino triazole did not seem to injure crops which were planted after treatment. Application one to two weeks prior to bud stage was most satisfactory, although treatment of regrowth after mowing also gave good results. A rate of 4 or 6 lbs/A of this chemical seemed necessary for adequate control; studies are underway to determine the efficiency of a single dose as compared with lower rates given several times.

Abstracts

Effect of various herbicides on smooth-leaved Canada thistle (Cirsium arvense var. integrifolium). Blanchard, K. L. and Dunham, R. S. A heavy infestation of smooth-leaved Canada thistle growing on crop land near Luverne, in the extreme southwestern corner of Minnesota, was treated May 31, 1956 with (1) amino triazole at 2.0, 4.0 and 6.0 lb/A, (2) polychlorobenzoic acid at 1.0, 2.0 and 3.0 lb/A, (3) emulsified 2,4-D acid at 0.5, 1.0 and 1.5 lb/A, (4) 2,4-D LV ester at 0.5, 1.0 and 1.5 lb/A, (5) MCP-amino triazole mixture at 0.5 + 1.0, 1.0 + 1.0 and 1.5 + 1.0 lb/A and (6) amino triazole-CMU mixture at 2.0 + 0.5, 3.0 + 0.5 and 4.0 + 0.5 lb/A. Duplicate square rod plots were used for each treatment level, and all plots were randomized within the experimental area. The thistles, for the most part, were generally within a few days of showing first buds with a sprinkling of buds already noticeable throughout the population, and were 10-14 inches tall. The period from time of treatment to time of evaluation was one of heavy rainfall, particularly from mid-June to mid-July. On

July 11 the Results of the treatments were as follows: (1) 65, 85, and 88% control, (2) 30, 55, and 82%, (3) 45, 70, and 98%, (4) 72, 79, and 75%, (5) 65, 69, and 77%, and (6) 20, 38, and 45%, respectively. Further evaluation will be made on the basis of degree of regrowth in the spring of 1957. (Contribution of Minnesota Department of Agriculture and the Department of Agronomy and Plant Genetics, Institute of Agriculture, University of Minnesota, St. Paul. Paper No. 3659, Sci. Jour. Series, Minn. Agric. Expt. Station.)

Pre-tillage treatment with ATA and 2,4-D for Canada thistle control in flax, soybeans and corn. Blanchard, K. L., Jordan, L. S. and Jensen, E. H. ATA (amino triazole) was applied to 1-acre plots infested with Canada thistle at 6 widely distributed locations in Minnesota. 2,4-D butoxyethanol ester was applied to separate plots at 4 locations at 1 lb/A. Rates of ATA were 5 lb/A at 5 locations and 7½ lb at one location. The herbicides were applied prior to any tillage operations in the spring. The seedbed was prepared 7-10 days after treatment and the crop was planted immediately. Results: Successful Canada thistle control was obtained at only one location. No other treatment at any of the locations sufficiently controlled the Canada thistle. Further evaluation of these treatments will be taken on the basis of regrowth in the last spring of 1957. (Contribution of the Minnesota State Department of Agriculture and the Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3657, Sci. Jour. Series, Minn. Agric. Expt. Station.)

Amino triazole on Canada thistle. Bondarenko, D. D. and Willard, C. J. Triplicated square rod plots infested with Canada thistle were treated with amino triazole at 2, 4, 6, and 12 lb/A in 80 gpa water April 28, 1956; at 2, 4, 6, and 8 lb/A on May 5, 21, and 28, and June 9; and at 4 and 8 lb/A on July 2. Plots treated April 28 were disced May 19 and planted to grain sorghum on June 14; plots treated May 5 were plowed May 28 and later planted to sweet corn and soybeans; plots treated May 21 were plowed June 25 and planted to corn June 29; plots treated May 28 and June 9 were plowed May 25 and planted to soybeans June 29. Plots treated July 2 were mowed August 2. On October 10 plots treated April 28 and disced May 19 indicated kills of 65, 80, 95, and 90 percent at 2, 4, 6, and 12 pounds, respectively. Plots treated May 5 and plowed May 28 indicated kills of 0, 2, 93, and 97 percent at 2, 4, 6, and 8 pounds, respectively. Plots treated May 21 and 28, and June 9 and plowed June 25 indicated a 90 to 100 percent kill at all rates. No crop showed amino triazole injury at any rate. Plots treated July 2 and mowed August 2 indicated kills of 90 to 100 percent. Amino-triazole was applied at 2, 4, 6, 8, 12 and 16 lb/A on June 10, 17, and 24 on regrowth thistles in an alfalfa field mowed June 9. About half these plots were plowed August 23. On October 10 all plots, regardless of rate or tillage used, indicated 98 to 100 percent kill. 1956 observations on plots treated May 5 and plowed May 18, 1955, and regrowth thistles treated August 5, 1955 following May 25 plowing indicated continued excellent results without retreatment. (Contribution of the Ohio Agricultural Experiment Station.)

Control of Canada thistles with amino triazole and chlorinated benzoic acids. Buchholtz, K. P. Plots of Canada thistles in cultivated land were treated on June 12 when the thistles were in the early bud stage using 20 gallons of spray per acre. Materials used were 2,4-D as an amine salt, 2,3,6-trichlorobenzoic acid as the sodium salt (2,3,6-TBA, Heyden 1281), 2,3,5-trichlorobenzoic acid as an amine salt (2,3,5-TBA, Hooker X80), amino triazole (AT) and mixtures

of AT and 2,3,6-TBA as well as 2,4-D and 2,3,6-TBA. Prior to treatment shoots were counted on all plots. Plots with similar infestations were grouped as replicates. Estimates of top kill of thistles were obtained on July 12. On July 30 the area was plowed and fitted. Counts of shoots on the recovery were made on September 28.

Material	Lb/A	Thistle shoots per sq. ft.	Top kill ind. x[1]
AT	4	.17	9.3
AT	8	.20	9.5
AT + 2,3,6-TBA	4 + 2	.43	9.5
AT + 2,3,6-TBA	2 + 1	.69	8.0
2,3,6-TBA + 2,4-D	1 + 1	.86	6.5
2,4-D	1	.97	8.0
AT	2	1.06	8.0
2,3,6-TBA	4	1.73*	6.5
2,3,5-TBA	4	2.64**	2.5
2,3,6-TBA	1	2.89**	5.0
2,3,6-TBA	2	3.18**	5.8
Check	- -	3.45**	0.3
LSD 5 pct. level		1.35	- -
LSD 1 pct. level		1.81	- -

[1] 10 - complete kill, 0 - no kill

The shoot counts show that AT was more effective than the other materials in reducing the regrowth of the thistles. Due to the high variability significance

could not be shown between the various application rates of AT, the mixtures of AT, 2,4-D, or the mixture of 2,3,6-TBA and 2,4-D. As a group the benzoic acid applications were low in activity on this weed. Applications containing AT resulted in nearly complete kills of the treated top growth in 4 weeks. (Contribution of the Dept. of Agronomy, Univ. of Wis., Madison.)

Fall application of soil sterilants on Canada thistle (Cirsium arvense). Bush, D. A. Triplicate square rod plots of Canada thistle growing on a Hastings silt loam, a soil that ranges from a medium to a heavy silt loam, were treated November 21, 1955. Treatments were sodium chlorate at 6 lbs/square rod; concentrated borascu at 14 lbs/square rod; D. B. Granular at 6 lbs/square rod; erbon (2-(2,4,5-trichlorophenoxy)-ethyl-2,2-dichloropropionate) at 2 pints/square rod; 2,4,5-T Amide at 60 lbs/acre; and 2,4-D Amine at 80 lbs/acre. Estimates of percent kill were made in September 1956. Sodium chlorate at 5 lbs/square rod gave 99.5 percent control; concentrated borascu at 14 lbs/square rod gave 98.33 percent control; D. B. Granular at 6 lbs/square rod gave 88 percent control; erbon at 2 pints/square rod gave 99.8 percent control; 2,4,5-T Amide at 60 lbs/acre gave 71 percent control; and 2,4-D Amine at 80 lbs/acre gave 80 percent control. (Contribution of the Division of Noxious Weeds, Nebraska Department of Agriculture and Inspection, Lincoln, Nebraska.)

Amino triazole on Canada thistle (Cirsium arvense). Bush, D. A. Triplicate square rod plots of Canada thistle were treated with 4, 6, and 8 pounds of amino triazole and 100 gallons of water/acre June 27, 1955. The thistle at treating date was in the bud stage of growth. Evaluation of the treatments was made June 20, 1956 with all rates showing 90 percent or better control. The thistle plants which had survived after one year were all sick chlorotic plants. There was no significant difference on control between rates. All plots were retreated June 20, 1956 with a 4 lb. rate of amino triazole in 100 gallons of water/acre. (Contribution of the Division of Noxious Weeds, Nebraska Department of Agriculture and Inspection, Lincoln, Nebraska.)

The effect of herbicide combinations on Canada thistle (Cirsium arvense Scop.). Ingle, M., Lee, O. C., and Hart, R. D. Several studies on the effect of amino triazole (AT) in combination with other herbicides on Canada thistle were made. The experimental area was a densely infested bluegrass pasture in Eastern Indiana. The first experiment was started on July 27, 1955. At this time, the thistle plants were about two feet high and were flowering. Herbicides included in this test were: AT, 4 lb/A; 2,4-D 2 lb/A; AT, 2 lb/A plus 2,4-D, 2 lb/A; AT, 4 lb/A plus 2,4-D, 2 lb/A. Plant counts ten weeks later showed that AT and 2,4-D alone were giving 87% and 58% control, respectively. In combination, control dropped to about 25%. By the following spring, AT alone was still giving 75% control and 2,4-D alone, 55% control. The combinations showed 23% and 8% control at this time. By October 1956, none of the treatments appeared to be giving any control.

On May 22, 1956, ½ and 2 lb/A AT was applied in combination with ½ lb/A CMU (DL). Thistles were 15-18 inches high with no buds formed. Two months later the ½ lb/A rate of AT was giving 80% control while the 2 lb/A rate was giving only 60% control. These values held constant until at least mid-October. Control by these combinations was slightly below that given by 4-6 lb/A AT applied at the same date. It will be of interest to observe how much of the control from these combinations is carried over into the following year. (Contribution of the Department of Botany and Plant Pathology, Agricultural Experiment Station, Purdue University, Lafayette, Indiana.)

Control of Canada thistle and perennial sow thistle with M.C.P. and 2,4-D. Keys, C. H. In 1955 an area heavily infested with Canada thistle and perennial sow thistle and sown to oats was sprayed with the amine and ester formulations of M.C.P. and 2,4-D at ¼, ½, 1, 2 and 4 lb/A acid equivalent. The plots were permanently marked and in 1956 re-treatments were applied to the thistle growing in a stubble crop of oats. Spraying was done on July 10 when the oats were approximately 12 inches high and the thistle were, for the most part, in the early bud stage. It was of interest to note the stimulation of crop growth that appeared to be proportional to the degree of weed control achieved by the previous year's treatments. Control of thistle in the crop followed much the same pattern as in 1955. The following table provides information as to degree of weed control and resultant crop yield.

Percentage weed control and crop yield in Bu/A.

Treatment		Rate in pounds acid/Acre ¼	½	1	2	4
M.C.P. Amine	% control	0	5	10	75	92
	Crop Yield	12.9	8.4	13.1	25.5	25.4
M.C.P. Ester	% control	5	13	50	85	100
	Crop Yield	11.6	21.8	20.7	23.5	23.4
2,4-D Amine	% control	20	60	80	95	100
	Crop Yield	14.1	16.7	24.1	28.5	27.0
2,4-D Ester	% control	45	80	93	100	100
	Crop Yield	18.8	27.8	19.6	13.6	17.5

The ¼ and ½ lb/A rates that would normally be used for control in the growing cropwere relatively ineffective with exception of ½ lb/A of 2,4-D ester. The 1 lb. rate of 2,4-D amine and ester controlled top growth so that the weeds did not bother harvesting operations, and all 2 lb rates were quite effective. The 4 lb rate , although very effective, was higher than actually necessary for complete control. (Contribution from Experimental Farm, Scott, Sask.)

Effect of amino triazole on Canada thistle when applied at different growth stages. Lee, Oliver C. Triplicated plots infested with Canada thistle (in a permanent bluegrass pasture) were sprayed with amino triazole at 4 and 6 lb/A on May 4, 12, 22, 29, June 6, 15, and July 24, 1956. Plants were not disturbed by plowing, cultivation or clipping. Percent of kill was recorded on October 23. Only a very slight difference was found between the 4 and 6 lb/A rates regardless of time applied. May 4 treatments gave practically no results. Slightly better kill was obtained with May 12 treatments. Best kill was obtained with May 22 and 29 treatments which ranged from 80-95% kill. Plants during that period ranged from 18 to 34 inches in height. Buds had formed by May 29. June 6 and 15, in bud or early blossom stage, treatments were less effective than those made earlier. Stands of thistles on other plots treated with 4, 8 and 10 lb/A on September 22, 1955, when plants were mature, were not

reduced by any of the rates. Approximately a 50% reduction in stand resulted from treatments of 4, 6, 8, and 10 lb/A made October 6, 1955 to regrowth after plants were mowed on August 18. Plants were 3"-6" when sprayed. Kills from 8, 12, and 16 lb/A applied to regrowth 10-12 inches high on July 24 after mowing on June 6, 1956 were equal to results obtained with application made on June 6 and 7 but not as good as those made on May 22 and 29. (Dept. of Botany and Plant Pathology, Purdue University, Agricultural Experiment Station, Lafayette, Indiana.)

Post-emergence application comparison of two herbicides (1) 3-amino-1 2,4-triazole (ATA (2) boron trioxide with 7% 2,4-D mixture ("DB Granular") on Canada thistle at 4 locations, 3 in S.D., one in Minn. MacDonald, W. P.; Zinter, C. C.; Slough, A. T. ATA at 10# acid equiv. in 80 gal. of water per A & "DB Granular" at 800 lbs. product per A; 1 sq. rod applications, no replicates. Applied early in June, plants from rosette to bud stage. In late Sept. control was satisfactory with ATA at 3 locations, "DB Granular" good at only 1 location. (Contribution of F. H. Peavey & Co., Minneapolis, Minn.)

Canada thistle control with amino triazole. Slife, F. W. Rates of 2, 4, 6, and 8 lbs. of acid of amino triazole were applied to Canada thistles on May 15, 1956. Thistles were 5 to 6 inches at time of application. Two weeks after application the area was plowed and immediately sown to soybeans. No injury symptoms were noticeable on the soybeans throughout the growing season. As of September 15, 1956 no thistles were present in the 6 and 8 lb. plots. There was 5 percent regrowth in the 4 lb rate plots and 15 percent regrowth in the 2 lb rate plots. Fifty percent of the regrowth in both the 2 and 4 lb rate plots were completely white while the other 50 percent appeared normal. In additional plots, Canada thistles were mowed down on May 20 and the regrowth treated on June 20 with 2, 4, and 6 lbs of aminotriazole. This treatment would simulate treatment after small grain harvest. Two weeks after treatment half of all the treatments were plowed down while the other half was allowed to remain standing. As of September 15, 1956, there was no difference between plowing or not plowing. The 6 lb rate had no regrowth as of September 15, and the 4 lb. rate had 5 percent, most of which was completely white, and the 2 lb. rate had 20 percent regrowth, but most of this was completely white. All plots will be continued through 1957 to study the effect of the lighter rates of amino triazole repeated as compared to higher applications applied all at one time. (Contribution of the Illinois Agricultural Experiment Station, Urbana, Illinois.)

Control of perennial weeds in established legumes grown for seed. Yeo, R. R. and Dunham, R. S. Perennial sow thistle and Canada thistle were sprayed in alfalfa and alsike clovers and white cockle in red clover with the following herbicides and at the following rates in lb/A: polychlorobenzoic acid, 1-½ and 2-½; 2,3,6-TBA, 2 and 4; ATA (amino triazole), 4 and 8; MH, 5 and 8; 4-(2, 4-DB), ½ and 1, 2,4-D, ½. Applications were made when the sow thistle was beginning to send up flower stalks; Canada thistle was 8-10 in. tall; and Canada thistle was in early bloom (3-5 ft. tall). Results: All high rates of each treatment top-killed the sow thistles and those Canada thistles up to 10 in. tall. The low rate of ATA was equally effective. ATA was the only chemical to control Canada thistles in early bloom. All the legumes were top-killed with polychlorobenzoic acid, 2,3,6-TBA and ATA. MH and 2,4-D seriously thinned the stand of alfalfa. The 4-(2,4-DB) had no apparent affect on the legumes and yet controlled the sow and Canada thistles at the 1 lb/A rate. Other applications of 4-(2,4-DB) at 2½ and 5 lb/A on sow and Canada thistles in alsike clover

gave complete control of both weeds with no apparent effect on the seed yield. (Contribution of the Department of Agronomy and Plant Genetics, University of Minnesota, Paper No. 3662, Sci. Jour. Series, Minn. Agric. Exp. Sta.)

FIELD BINDWEED

Summary W. M. Phillips

Six abstracts were received. Two were from Saskatchewan and involved cultivation and 2,4-D for bindweed control. Several cultivations followed by an application of 2 lb./A 2,4-D ester or 2 lb./100 sq. ft. DB Granular (a combination of sodium pentaborate and 2,4-D) gave eradication. An ester of 2,4-D at 12 oz./A applied after cultivations resulted in marked reduction in stand.

Benzoic acid materials, reported as sodium salt of 2,3,6-TBA and as polychlorobenzoic acid, were outstanding in Kansas, Nebraska, and Texas. Rates used varied from 15 to 100 lb./A. In Nebraska 20 lb./A gave 80% stand reduction. This was equal to results obtained with sodium chlorate at 960 lb./A. All other reported stand reductions were, after treatment with benzoic acid materials, from 95% to 100%.

One or more workers in Kansas, Nebraska, and Texas reported generally unsatisfactory bindweed control following treatments with 40 to 100 lb./A 2,4-D amine, 2,4,5-T ester, 2,4-D amide, 2,4,5-T amide, 2-(2,4,5-TP) ester and amine, and 2,4,5-TES. Not all of these chemicals and rates were used in each state. In Texas, erbon at 320 lb./A gave 98% control but lower rates, in all three states, were much less satisfactory. Other chemicals, including several urea compounds, and combinations of monuron, boron, and sodium chlorate, were tested. None of these materials consistently gave good bindweed control.

The Texas experiments were conducted under both dryland and irrigated conditions. Some variations in results were noted between the two sites. In Kansas, drought was suggested as a factor which may have affected results.

Abstracts

Chemical control of field bindweed (Convolvulus arvensis). Best, K. F. A heavily infested 50-acre field in the Assiniboia area of Southern Saskatchewan was cultivated four times during the summer of 1955. Tillage was done with a disk-type implement and the final operation was completed during the latter part of July. During the third week of August, the entire area was sprayed with an ester of 2,4-D at the rate of 12 ounces per acre. Prior to spraying, the operator, contrary to instructions, cultivated a border around the field, cutting it down to a 35-acre tract. Field inspections in late August showed severe wilting of the bindweed. By October, most of the plants appeared brown and badly withered with no signs of regrowth. The roots in most cases appeared to be dead down to a depth of three inches. The land which had been cultivated the day before spraying had a healthy green growth of bindweed, while the rest of the field was brown and shrivelled by the chemical. Plans to cultivate once again before freeze-up did not materialize because of weather conditions. In the spring of 1956 this field was sown to wheat and sprayed once during the crop year to control top growth of the weed. Unfortunately, hail seriously damaged the crop but fall inspection of the area indicated a marked reduction in the prevalence of the field bindweed. (Contributed by Experimental Farm, Swift Current, Sask.)

Control of field bindweed (Convolvulus arvensis). McCurdy, E. V. A number of areas containing solid infestations of field bindweed were cultivated until July in 1955, then allowed to make rapid growth until the middle of August. Some of the areas were then treated with a low volatile ester of 2,4-D at 2 lb./A and others with DB Granular at 2 lb./100 sq. ft. Notes taken in 1956 indicate that eradication of this weed was complete in both cases. (Contribution by the Experimental Farm, Indian Head, Sask. Canada.)

Field bindweed control with several phenoxy compounds. Phillips, W. M. Duplicate square rod plots of field bindweed were treated May 11, 1955, with the following chemicals and rates in lb. per acre: triethanolamine salt of 2,4-D, 40 and 60; propylene glycol butyl ether ester of 2-(2,4,5-TP) 40 and 60; sodium pentaborate-2,4-D complex, 640 and 960. Two other experiments using the same treatments were established August 5 and October 18, 1955. In addition propylene glycol butyl ether ester of 2,4,5-T, 2,4-D amide, and 2,4,5-T amide at 40 and 60 lb. per acre were applied on October 18. Counts of surviving bindweed were made in September 1956. Prolonged drought has made it difficult to evaluate the results but none of the treatments resulted in satisfactory bindweed control. The 40 lb. rate of both amide formulations gave the greatest reduction in stand but approximately 40 plants per square rod remained in September 1956. The 60 lb. rate of the same materials appeared to be less satisfactory. 2,4-D amine and the 2,4-D-boron complex applied in October were no more effective than when applied in May or August. 2-(2,4,5-TP) and 2,4,5-T maintained excellent bindweed control until July 1956, but by the end of the growing season all plots had vigorous regrowth. (Contribution from Field Crops Research Branch, ARS, USDA, and No. 105 Fort Hays Branch, Kans. Agric. Expt. Sta. Hays, Kansas.)

Field bindweed control with soil sterilizing chemicals. Phillips, W. M. Duplicate square rod plots of bindweed were treated May 11, 1955 with the following chemicals and rates in lb. per acre: fenuron and monuron, 60 and 80; erbon, 80 and 160; sodium pentaborate with 4% monuron, and sodium pentaborate with 25% sodium chlorate and 1% monuron, 960 and 1280. Two other experiments using the same treatments were established August 5 and October 18, 1955. Sodium salt of 2,3,6-TBA at 15 and 30 lb. per acre was applied May 11 and October 18. Drought conditions probably affected results and delayed emergence of remaining plants, but observations and plant counts in September, 1956, indicated that 2,3,6-TBA gave excellent bindweed control at both rates and on both dates of application. All plots treated with 2,3,6-TBA had more than 95% stand reduction. The higher rate appeared to be superior to the 15-lb. application, but differences were small. Remaining bindweed plants exhibited abnormal growth and little or no other vegetation was growing on the plots. Under conditions of the experiment, fenuron gave greater stand reductions than monuron. In previous tests at this location the two materials have given nearly equal results. In 1955 fenuron applied in May gave about 95% stand reduction. The borate-4% monuron material at 1280 lb. applied either in May or August caused similar reductions. All other treatments were, in general, unsatisfactory. Erbon suppressed bindweed growth until July, 1956, but regrowth occurred during the remainder of the season. (Contribution from Field Crops Research Branch, ARS, USDA, and No. 107 Fort Hays Branch, Kans. Agric. Expt. Sta. Hays, Kansas.)

<u>Control of field bindweed.</u> Sand, P. F. Duplicate square rod plots of field bindweed were treated November 8, 1955 with 2,4-D amine at 60, 80 and 100 lb./A; 2,4-D amide at 80 lb./A; 2,4,5-T amide at 80 lb./A; sodium chlorate at 6 lb./sq. rd.; DB Spray Powder at 4, 6, and 8 lb./sq. rd.; and the sodium salt of 2,3,6-trichloro benzoic acid at 20, 60 and 100 lb./A. Estimates of percent kill were made in September of 1956. Sodium chlorate at 6 lb./sq. rd. and sodium salt of 2,3,6-trichloro benzoic acid at 20 lb./A gave about 80 percent kill. The sodium salt of 2,3,6-trichloro benzoic acid at 60 and 100 lb./A gave 100 percent kill. <u>All other chemicals gave less than 50 percent kill</u> of the bindweed. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

<u>Effect of soil sterilants on field bindweed (Convolvulus arvensis).</u> Wiese, A. F. and Rea, H. E. During the fall of 1955, soil sterilant applications for bindweed eradication were made on Pullman silty clay loam under both dryland and irrigated conditions. The experimental design for each test was a randomized block with 2 replications. Data reported here were taken in September 1956. In the dryland test, complete eradication was obtained only with 1/2 pound of polychlorobenzoic acid (13.3% dichloro, 31.6% trichloro, 51.7% tetrachloro and 3.4% pentachloro) per square rod. Polychlorobenzoic acid at 1/4 pound per square rod and Baron [2-(2,4,5-trichlorophenoxy ethyl 2,2-dichloropropionate] at 2 pounds per square rod gave 98 percent control. Other herbicides and rates per square rod which gave 75 percent or more control were Karmex FW (3 phenyl-1, 1-dimethyl urea) at 1/2 pound, Baron at 1 pound and 2,4-D ester (butoxy ethanol) at 1/4 pound. Herbicides and rates per square rod which gave from 50 to 75 percent control were 2,4-D ester (butoxy ethanol) at 1/2 pound, 2,4-D ester adsorbed to clay particles at 1/4 and 1/2 pound, Baron at 1/2 pound and Karmex FW at 3/8 pound. CMU at 3/8 pound per square rod gave 40 percent control and Karmex FW at 1/4 pound per square rod did not reduce the weed stand significantly below the check. Rainfall for the experimental period was 10.3 inches.

In the irrigated experiment, polychlorobenzoic acid at 1/2 and 1/4 pound per square rod gave 99 and 93 percent control, respectively. Control with other rates of herbicides per square rod were: 75 percent with 1 pound Baron, 73 percent with 7 pounds of Atlacide, 71 and 47 percent with 1/2 and 1/4 pound, respectively, of 2-(2,4,5-trichlorophenoxy) propionic acid (amine) and 39 percent with 1/2 pound of Baron. DB Granular at 4 and 6 pounds per square rod and Natrin (2,4,5-trichlorophenoxyethyl sulfate) at 1/2 pound per square rod did not reduce the bindweed stand significantly below the check. The experimental area received six 4-inch irrigations during the test in addition to rainfall. (Contribution of the Amarillo Experiment Station, Bushland, Texas, USDA and Texas Agricultural Experiment Station cooperating.)

Hoary Cresses and Bur Ragweed

Paul F. Sand

Summary

Bur ragweed has been successfully controlled by the use of 2,4-D at 1 and 2 lb/A when treated in June. Treatments applied during July did not give satisfactory results. 2,4-D ester applied in an oil-water emulsion did not show results different from the ester in water treatments. ATA applied at 2 and 4 lb/A gave effective control of this weed.

The existing infestation of hoary cress was eradicated by continuous cultivation for three years, at Lethbridge, Alberta, Canada. A total of 22 to 24 cultivations were required during this period. A crop fallow system was also successful in controlling hoary cress. Barley and spring rye were found to be good crops to use for this purpose.

Abstracts

Control of bur ragweed at Minden, Nebraska. Sand, P. F. Bur ragweed (Franseria tomentosa) was treated on June 22, 1955 at Minden, Nebraska. The weeds were growing on crete silt loam which has a surface soil of about 10 inches of a black mellow silt loam underlain by 10 to 14 inches of heavy compact clay or silty clay which resembles a hardpan in physical characteristics. The rain fall during June was 5.61 inches and was well distributed throughout the month so that moisture was plentiful at the time of treatment.

Stand counts were made before treatment on June 21, 1955 from five 2 x 4 quadrats permanently located in each plot. Stand counts were made again on June 20, 1956 to determine the reduction in stand resulting from the 1955 treatments. Plots were 20 x 20 feet and there were three replications.

Treatments and percent kill are: ACP L129, a butoxy ethanol ester with additives at 2 lb/A gave 92 percent kill; 2,4-D isopropyl ester at 1, 2 and 4 lb/A gave 85, 92 and 87 percent kill; 2,4-D isopropyl ester at 1, 2, and 4 lb/A in a 1 to 5 oil-water emulsion gave 86, 84 and 83 percent kill; Amino triazole at 2 and 4 lb/A gave 85 and 93 percent kill; 2,4-D amine salt at 2 and 4 lb/A gave 70 and 85 percent kill; a 25 percent reduction in stand was noted in the check. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

Treatment of bur ragweed (Franseria tomentosa) with 2,4-D. Sand, P. F. Triplicate 20 x 20 foot plots of bur ragweed were treated with 2,4-D at Bertrand, Nebraska in 1955 at weekly intervals beginning June 6 and continuing through July 15 for a total of six different dates of application. The bur ragweed was growing on wabash silt loam, basin phase which usually has adequate drainage except during seasons of unusually heavy rainfall. Rainfall during the months of June, 1955 totaled 3.79 inches and was well distributed throughout the month. No rainfall was received during the first two weeks of July.

Stand counts were made before treatment in 1955 from 40 square feet in each plot and again in June of 1956. The following table gives percent kill of bur ragweed one year after treatment.

Treatment	Rate lb/A	Percent kill of bur ragweed Date treatment applied in 1955 6/6	6/16	6/22	6/30	7/7	7/15	Ave.
2,4-D amine salt	2	72**	64**	86**	57**	47**	25	58
	4	77**	94**	76**	88**	47**	30	69
2,4-D isopropyl ester	1	73**	92**	82**	82**	27	31	65
	2	95**	89**	94**	94**	45**	38	76
	4	93**	93**	95**	91**	58**	59**	82
Check		0	0	0	0	0	0	
Average		82.7	86.3	86.6	82.3	49.9	36.5	70.5

** Significantly different from the check at the .01 level.

(Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

<u>Cultural and cropping control of lens-podded hoary cress</u> (<u>Cardaria draba var. repens</u>). Sexsmith, J. J. Testing of cultural and cropping measures for the control of lens-podded hoary cress has been conducted over a 10-year period (1946-1955, incl.) on a shallow black loam 15 miles east of Calgary, Alberta. A subsurface cultivator (blade) was compared with a disk-type cultivator (one-way disk) for complete eradication of a cress infestation. The crops and cropping procedures under test included spring wheat (wheat continuous, wheat-fallow, wheat-wheat-fallow); barley (barley-fallow); spring rye (rye-fallow); winter wheat (wheat-fallow); and fall rye (rye continuous as hay, rye continuous as grain, rye-fallow). Duplicate half-acre plots were used, field equipment was used for seeding and cultural operations, and fallow operations were made at intervals to allow for approximately four days' regrowth of cress shoots above soil surface except when prevented by adverse conditions. The original evaluation of the cress infestation was made in the spring of 1946 by taking frequency counts with a 1/4-sq.-metre frame at 20 locations in each plot. Subsequent counts were taken in a similar manner on cropped plots only, immediately after removal of the crop. For the last five years, all crops have been treated with the butyl ester of 2,4-D at a rate of 8 oz/A. During the last four years, the butyl ester of 2,4-D at a rate of 24 oz/A has been applied to the fallows of a new set of spring wheat-fallow and barley-fallow rotations, when the cress was in bud stage, to replace the early season cultural operations. Crop yields were determined by taking 20 sq.-yard samples from each plot. Results: Continuous cultivation, with either the blade cultivator or the one-way disk, eradicated the existing infestation of hoary cress by the end of the third season with a total of from 22 to 24 operations during the three years. Average intervals between cultivations were approximately 15 days in the first year and 20 days in the second year. Barley and spring rye were found to be slightly superior to spring wheat for the control of hoary cress as judged by the number and interval of cultivations in the fallow years. A fall rye-fallow rotation gave no better control than did a spring grain-fallow rotation unless the fall rye rotation was preceded by a full year of fallowing prior to the first year of seeding. Winter wheat and spring rye have proved to be unsatisfactory crops for the area. Over the 10-year period, based on frequency counts of cress shoots, the rating of the cropping systems in order of decreasing effectiveness for cress control was as follows: barley-fallow, fall rye-fallow, spring wheat-fallow, spring wheat-wheat-fallow, fall rye continuous (as hay), fall rye continuous (as grain), spring wheat continuous. The 10-year average yields per acre of

rotation of spring wheat were in the reverse order to the effectiveness of the rotation for cress control, being 16.1 bu for continuous wheat, 15.9 bu for wheat-wheat-fallow, and 14.7 bu for the wheat-fallow rotation. Although tests for comparing the use of 2,4-D in fallow years with complete use of cultural implements for fallowing have not been carried for a long enough period, evidence to date indicates that there is no difference in the effects on cress infestation or on crop yield. The use of 2,4-D on fallows would be a help in the preservation of stubble and, therefore, a good practice for erosion control while carrying on a program of hoary cress control. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.)

Leafy Spurge and Russian Knapweed

Summary **Lyle A. Derscheid**

Twelve abstracts reporting work done on leafy spurge and four reporting work done on Russian knapweed were submitted. For the most part they confirmed earlier findings with chemicals that are only four or five years old. However, there were a few results from the use of newer chemicals. The second report on leafy spurge arrived late and is not included in this summary.

In two cases 11 pounds, in one case 10 pounds and in 1 case 8.2 pounds of Concentrated Borascu per square rod eliminated the leafy spurge and in another case 8.2 pounds gave only "fair" control. This more or less confirms previous findings which indicated that 10 pounds was sufficient to kill this weed.

Earlier results with sodium chlorate indicated that 5 pounds per square rod were sufficient for Russian knapweed, especially if applied in the fall, and that this same rate was generally as effective on leafy spurge as somewhat higher rates. However, sodium chlorate was not as consistently effective on this weed as were the borax compounds. In one test this year, 5.5 pounds per square rod killed 60% of the spurge when applied in May and 70 percent when applied in October in Saskatchewan.

It has been felt that 10 pounds per square rod of the borate-chlorate mixtures were sufficient for leafy spurge, but that close to 15 pounds were required for Russian knapweed. These abstracts report that 11 pounds per square rod of Polybor-chlorate in one test and Chlorax in another eliminated 100 percent of the leafy spurge, 8 pounds of Polybor-chlorate thinned the stand of Russian knapweed at another location and 5.5 pounds of Polybor-chlorate gave only "fair" control of leafy spurge at another.

The borate - 2,4-D mixtures have been tested less extensively, but previous data indicated that 4 to 5 pounds of product per square rod generally eliminated leafy spurge and Russian knapweed. Fall applications appeared to be somewhat more effective. Reports this year include 3 fall applications and 2 spring applications of DB Granular and 1 spring application of DB Spray, all at 2 3/4 pounds of product per square rod. All of these treatments eliminated 99 percent of the leafy spurge. Likewise, 2 spring applications of 5 and 5.5 pounds of DB Granular and 1 spring application of 5.5 pounds of DB Spray killed 99 percent of the leafy spurge. In another trial 4, 6 and 8 pound rates of DB Spray applied in the fall, each killed 90 percent of the leafy spurge and another trial 5.5 pounds of DB Granular applied during late fall killed 99 percent. The use of 5.5 pounds and 8.2 pounds per square rod of each chemical resulted in "excellent stand reduction" of Russian knapweed.

Ammonium sulfamate at 4 pounds of active ingredient per square rod has generally been effective in eliminating 95 percent of leafy spurge and Russian knapweed. Fall applications have been somewhat superior to summer treatments. This year 5.4 and 8 pounds of 80% product per square rod eliminated 90 and 100 percent of the leafy spurge in one Saskatchewan trial.

CMU and related compounds have, in general, been unsatisfactory for the elimination of deep rooted perennial herbaceous weeds. This year 1 pound active ingredient per square rod of monuron killed 80 percent of leafy spurge and 1/3 pound active ingredient of monuron, diuron and fenuron eliminated 10 to 80 percent in one

test, while rates of 3 pounds of fenuron and diuron per square rod failed to eliminate over 50 percent in another.

Heavy rates of 2,4-D have given rather erratic results. In one trial 24 and 48 pounds per acre of an ester applied during late fall showed 88 and 97 percent elimination of leafy spurge one year after treatment. In another trial, late fall applications of 40 and 60 pound rates of 2,4-D amide gave 28 and 72 percent elimination, while 40 and 60 pound rates of 2,4-D amine killed 49 and 60 percent of the spurge. In a third trial, May applications of 35, 70 and 105 pound rates killed less than 50 percent of this weed and a September application of 57, 113 and 170 pound rates appeared to have killed 90 to 100 percent by the next June. Regrowth had occurred to the extent that only 85 percent of the spurge was eliminated by fall. This last test is typical of many trials conducted by the writer. The weeds are held in check until early summer, then regrowth and new seedlings contribute to the infestation making it necessary to use a föllow up treatment during the summer.

A borate-urea mixture, a chlorate-borate-urea mixture, erbon, 2,3,6-TBA, ATA and 2(2,4,5TP) were also reported this year.

A chlorate-borate-urea mixture was used in five tests. The results were not in complete agreement. In one trial, a summer application of Chlorea at 7½ lbs. of product per square rod were required to give 90 percent elimination of spurge while 5 pounds applied during the fall killed 95 percent and 7½ pounds eliminated 99 percent. In another test 8.2 pounds killed 83 percent and 11 pounds killed 98 percent. In one test on Russian knapweed 2½ pounds of product per square rod killed 97 percent when applied in the fall, but only 75 percent when applied in the summer. Five pounds applied in the fall, however, killed 97 percent of the weed. It appears that less chemical is required if it is applied during the fall,

A borate-urea mixture was used in 4 tests - 2 on leafy spurge and 2 on Russian knapweed. In one test, 5 pounds per square rod of Ureabor killed 75 to 80 percent of the leafy spurge and 7½ pounds eliminated 95 percent, but 2½ lbs. were unsatisfactory, while 2 and 4 pound rates were unsatisfactory in another test. On Russian knapweed a summer application of 7½ pounds of product per square rod eliminated only 30 percent of the weed, however, 7½ pounds applied in the fall eliminated 95 percent and 5 pounds killed 70 percent. In another test, 5.5 lbs. reduced the stand and 8.2 pounds were "quite effective". These data indicate that less chemical is needed if it is applied during the fall and that 7 to 8 lbs. per square rod are required for both weeds.

ATA had previously been reported as being very effective for eliminating leafy spurge when applied at a rate of 8 pounds acid equivalent per acre during late spring and that higher rates were ineffective against Russian knapweed when applied during the fall. One group of workers obtained 95 percent elimination of spurge with 10 pounds acid equivalent per acre in one test and 50 percent elimination in another indicating that results are erratic on leafy spurge. ATA was used in 3 tests on Russian knapweed and was unsatisfactory in all cases. Rates of 8 and 10 pounds acid equivalent per acre were ineffective when applied to knapweed growing in grass sods during the spring. Likewise 8 pounds were ineffective when applied to 6-inch growth and plowed under 10 days later.

The use of 2,3,6-TBA was reported once for leafy spurge and twice for Russian knapweed. An application of 40 and 60 pounds per acre after the foliage had frozen during the fall resulted in 99 and 100 percent elimination of spurge. A spring

application of 6 pounds on Russian knapweed appeared to hold the weed in check until mid August, but regrowth occurred after that date. A spring application of 4 pounds on Russian knapweed foliage that was plowed 10 days later eliminated about 90 percent of the weed.

Abstracts Leafy Spurge

Control of leafy spurge (Euphorbia Esula) Best K. F. Early June 1956 applications of DB granular and Concentrated Borascu at rates of 5 pounds per 300 sq. ft. (1.67#/100 sq. ft.) were applied to separate plots in a Leafy spurge infested area on light loam soil near Swift Current. In both cases the chemical was broadcast by hand. Fall inspections of both treatments in 1956 revealed apparent complete kill of the spurge while the grass remained unharmed. (Contributed by Experimental Farm, Swift Current, Sask.)

Amizol and Ammate singly, and heavy rates of 2,4-D and 2,4,5-T, singly and in mixtures with Amizol, for eradication of leafy spurge (Euphorbia esula)by late fall application. Blanchard, K. L. and Dunham, R. S. A Moderately heavy, but uniform, infestation of leafy spurge, growing in bluegrass-bromegrass pasture, 10 miles southwest of Minneapolis, was treated on September 29, 1955, with (1) 2,4-D butoxyethanol ester, (2) 2,4-D iso-octyl ester(3) 2,4-D amine, (4) 2,4,5-T ester, (5) 50-50 mixture of 2,4-D and 2,4,5-T esters, all at rates of 20 and 40 lb./A.; treatments (1a), (2a), (3a), (4a) and (5a) consisted of the same sequence of formulations as (1) - (5), at the same levels, to which had been added ATA at the rate of 0.5 and 1.0 lb./A.; (11) ATA at 1.0, 2.0, 4.0 and 8.0 lb./A. and, (12) ammonium sulfamate (Ammate) at 1.0, 2.0 and 3.0 lb./sq. rd. Duplicate square rod plots were used for each treatment level and all plots were randomized within the experimental area. Observations as to regrowth were taken in 1956 on the dates of June 21, July 9, July 17, and September 11. Results of the final evaluation are (at the 40 lb. rate): (1) 75% control, (2) 65%, (3) 92%, (4) 90%, (5) 75%, (3a) 80 95%, (4a) 100, 100%, (5a) 80, 92%. (12) at the 2.0 and 3.0 lb. rates gave 87 and 92% control, respectively. Further evaluation will be made in the late spring of 1957. (Contribution of Minnesota Department of Agriculture, and the Department of Agronomy and Plant Genetics, Institute of Agriculture, University of Minnesota, St. Paul, Minn. Paper no. 3667 Scientific Journal Series, Minn. Agricultural Experiment Station).

Further observations of borate compounds in the control of leafy spurge, 1956. Coupland, R. T. and G. W. Selleck. Polybor-chlorate (73% borates, 25% chlorate) and Concentrated Borascu (61.5% B_2O_3) were applied to a dense infestation of leafy spurge on sandy soil near Saskatoon in Sept. 1953, and again in May, 1954. Complexes of D-B (sodium borate 41% and 60% and 2,4-D 7%) were also applied at the latter date. In Sept. 1955, 100% control was maintained by Conc. Borascu at a rate of 4 lb., D-B at 1 lb. and Polybor-chlorate at 4 lb./100 sq. ft. By Sept. 1956, 100% control was not achieved on a single plot. Examination of shoots and roots of leafy spurge revealed that many of them were 1956 seedlings, while others, though resembling seedlings, had produced roots which were established prior to 1956. Excavation and removal of well established roots revealed no rhizomes or roots which were attached to adjacent plants. The chemicals had apparently eradicated the original infestation, and reinfestation was occurring through the establishment of seedlings. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation).

The effect of borate compounds on certain persistent perennials, 1956. Coupland, R. T. and G. W. Selleck. Concentrated Borascu (61.5% B_2O_3)at rates of 1, 2

and 4 lb. and D-B Granular (43.2% B_2O_3, 7% 2,4-D) at ½, 1 and 2 lb. of total product per 100 sq. ft. were applied on plots 16 x 100 sq. ft. in May and Sept., 1955, to toadflax on sandy-loam soil (in the black soil zone) near Hague, Sask., and to leafy spurge on sandy soil near Saskatoon. Similar treatments were made to toadflax and leafy spurge on sandy-loam soil (in the brown soil zone) at Parkbeg. The following weeds produced vigorous growth on many of the plots treated with the herbicides: Russian thistle, wild buckwheat, lamb's quarters, wild barley, goatsbeard, tumbling mustard, flixweed, peppergrass, sheep's sorrel, Russian pigweed, rose and western snowberry. Many grasses, such as bromegrass, couch grass, crested wheatgrass and spear grass, exhibited considerable tolerance to the herbicides while Kentucky blue grass was unable to tolerate more than the lightest rates of application. Where 100% control of leafy spurge and toadflax was obtained, roots were killed at depths varying from 4 in. to 3 ft. The average percentage control of weeds and regrowth of grass in Sept., 1956 (based on visual estimates) are presented below.

Herbicide	Rate of Application	Percentage Control Toadflax	Percentage Control Leafy Spurge	Percentage of Regrowth of Grass
Concentrated Borascu	1 lb./100 sq. ft.	99.3	55.0	96.0
	2 lb. " " "	99.6	88.3	71.5
	4 lb. " " "	99.6	99.6	41.0
D-B granular	½ lb. " " "	60.0	66.6	99.6
	1 lb. " " "	96.6	95.0	89.5
	2 lb. " " "	98.3	99.6	67.5

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon with, financial assistance from the Sas. Agric. Research Foundation.)

The effect of several herbicides on the control of leafy spurge, 1956. Coupland, R. T. and G. W. Selleck. Chlorea (sodium chlorate 40%, sodium metaborate 57%, CMU (monuron) 1%) at 50, 100 and 200 lb. total product, erbon (2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate) at 50, 100 and 150 lb. acid equivalent, ammate (ammonium sulphamate) at 435, 870 and 1305 lb., fenuron (3-(phenyl)-1, 1-dimethylurea) at 25, 50 and 100 lb., monuron (3-(p chlorophenyl)-1, 1-dimethylurea), and diuron (3-(3,4 dichlorophenyl)-1, 1-dimethylurea) at 50 lb. of active ingredient per acre were applied to 100-sq. ft. plots of leafy spurge in sandy soil near Saskatoon in June, 1955. After two seasons the CMU type compounds afforded from 10% to 80% control with almost complete eradication of grass. The heavy rate of erbon and the medium and heavy rates of ammate provided 90% to 100% control of leafy spurge accompanied by severe damage to grass. The Chlorea had little or no effect on the grass and provided less than 50% control of leafy spurge. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

The effect of heavy applications of 2,4-D amine on persistent perennial weeds, 1956. Coupland, R. T. and G. W. Selleck. 2,4-D amine was applied to toadflax (near Hague) and to leafy spurge (near Saskatoon) at rates of 35, 70 and 105 lb. of active ingredient per acre on plots 16 x 100 ft. in May, 1955. The intermediate

rate was applied to leafy spurge in July. The chemical was again applied to both species in September at rates of 57, 113 and 170 lb. acid equivalent per acre. The 2,4-D applied in May provided less than 50% control of both species while all of the fall applications provided 95% control or better in June, 1956. By September, the percentage of control of both species by fall treatments had deteriorated to 85% at the heaviest rate of application. Control was less effective at lower rates. (Contribution from the Dept. of Plant Ecology, Univ. of Sask. Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

Effectiveness of erbon, Ureabor and Chlorea as soil sterilants on leafy spurge. Derscheid, Lyle A. Duplicate 9-ft. by 15-ft. plots were treated on August 3 and September 12, 1955. Erbon was applied at rates of 1/2, 3/4 and 1 pound active ingredient per square rod, while the other two were each applied at rates of $2\frac{1}{2}$, 5 and $7\frac{1}{2}$ pounds of product per square rod. Estimates of the percentage of kill were made in May, 1956. They are given in the following table.

Chemical	Lb./sq. rd.	Percent Elimination Aug.	Sept.
Erbon	1/2	95	99
"	3/4	99	99
"	1	99	99
Ureabor	$2\frac{1}{2}$	35	83
"	5	75	80
"	$7\frac{1}{2}$	95	95
Chlorea	$2\frac{1}{2}$	0	70
"	5	73	95
"	$7\frac{1}{2}$	90	99

These data indicate that all rates of Erbon were effective, that $7\frac{1}{2}$ lb./sq. rd. of Ureabor were effective and that as little as 5 lb./sq. rd. of Chlorea were effective when applied in September but that $7\frac{1}{2}$ lb./sq. rd. were required in early August. This is the first time that these chemicals have been used on this weed by the author so the results are not conclusive. (Contributed by Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota.)

Post-emergence application comparison of two herbicides (1) 3-amino-1,2,4-triazole (ATA) (2) boron trioxide with 7% 2,4-D mixture ("DB Granular") on leafy spurge at Henry & Redfield, S.D. MacDonald, W. P.; Zinter, C. C.; Slough, A. T. ATA at 10# acid equiv. in 160 gal. of water & "DB Granular" at 800 lbs. product per acre; 1 sq. rod applications, no replicates; applied in early June at early bloom. In late Sept. "DB Granular" showed 95% or better control on both tests; ATA 95% on one test, 50% on the other. (Contribution of F. H. Peavey & Co., Minneapolis, Minnesota.)

Chemicals for leafy spurge control. Molberg E. S. Six chemicals were applied at different rates to leafy spurge growing on non-cultivated land. Applications were made in 1955 and the results observed in Sept. 1956. Treatments were made in quadruplicate on plots 100 sq. ft. in size. The chemicals used, rates of application /100 sq. ft. and the percentage reduction of leafy spurge were as follows. Fenuron (Karmex FW) 0.9 oz. 10.0%; 1.4 oz. 18.8%; 1.8 oz. 46.0%. Diuron (Karmex DW) 0.9 oz. 8.5%; 1.4 oz. 0.0%; 1.8 oz. 0.8%. A chlorate, borate,

urea mixture (Chlorea) 3 lb. 83.0%; 4 lbs. 97.8%; 5 lbs. 99.1%. A sodium chlorate, sodium metaborate mixture (Chlorax) 3 lb. 95.1%; 4 lb. 98.8%; 5 lb. 99.9%. Ammonium sulphamate (Ammate) 0.7 lb. 73.5%; 1.5 lb. 98.2%; 2.2 lb. 100%. Anhydrous borax (Concentrated borascu) 3.7 lb. 99.8%; 4.4 lb. 99.9%; 5.2 lb. 99.2%. (Contributed by the Dominion Experimental Farm, Regina, Sask.)

Anhydrous borax for leafy spurge. Molberg E. S. Anhydrous borax (Concentrated borascu) was applied to leafy spurge growing in bromegrass with a fertilizer spreader. The plots were 16 ft. wide and 250 ft. long, and were not replicated. The rates used were 1.5, 3.0 and 4.5 lb./100 sq. feet. The chemicals were applied July 28, 1955 and results observed in Sept. 1956. The untreated check plot had a cover of about 50% bromegrass and 50% leafy spruge. The 1.5 lb. rate reduced the weeds to 5%, and seemed to benefit the grass. The grass on this plot was taller and leafier than the check. The 3 lb. rate reduced the leafy spurge to less than 1%, and killed about 40% of the bromegrass. The 4.5 lb. rate eliminated all the leafy spurge and killed 80% of the grass. Russian thistle, a few wild buckwheat, and redroot pigweed were growing in the areas where the bromegrass had been killed. (Contributed by the Dominion Experimental Farm, Regina, Sask.)

Control of leafy spurge with fall treatments of several chemicals. Sand, P. F. Triplicate square rod plots of leafy spurge were treated November 10, 1955 after the foliage had frozen back. Stand counts were made before treatment on 9/26/55 from two square yard quadrats permanently located in each plot and again on 9/20/56. Treatments and percent kill are as follows: 2,3,6-trichloro benzoic acid sodium salt at 20, 40 and 60 lb./A. gave 81, 99 and 100 percent kill of leafy spurge; DB Spray Powder at 4, 6 and 8 lb./sq. rd. gave 89, 91 and 91 percent kill; 2,4-D amide at 40 and 60 lb./A. gave 28 and 72 percent kill; and 2,4-D amine salt at 40 and 60 lb./A. gave 49 and 60 percent kill. (Contribution of Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

Spring and fall application of various herbicides as soil sterilants for the control of leafy spurge (*Euphorbia esula*). Sexsmith, J. J. Spring (May 10) and fall (Oct. 13) treatments of several herbicides were applied to duplicate square-rod plots on a heavily spurge-infested loam near Calgary, Alberta in 1955. The area had a fair stand of mixed grasses, consisting of *Bromus inermis*, *Agropyron smithii*, *Poa secunda*, and *Festuca idahoensis*. Spring treatments included the following: sodium chlorate, 74% mixed borates plus 25% sodium chlorate (Polyborchlorate), and 90.5% disodium tetraborates plus 7.5% 2,4-D (DB Spray and DB Granular) at 2 lb./100 sq. ft.; 89% anhydrous sodium tetraborate (Concn. Borascu) at 3 lb./100 sq. ft.; and 94% disodium tetraborates plus 4% 3-(p-chlorophenyl)-1,1-dimethylurea (Ureabor) at 3/4 lb./100 sq. ft. Fall treatments included the following: sodium chlorate at 2 lb./100 sq. ft., Concn. Borascu at 3 lb./100 sq. ft., DB Spray at 1 lb./100 sq. ft., DB Granular at 1 lb. and 2 lb/100 sq. ft., Ureabor at 3/4 lb. and 1½ lb./100 sq. ft., and 2,4-dichlorophenoxyacetic acid (butoxy ethanol ester of 2,4-D) at 24 and 48 lb./A. Shoot counts were made at four fixed locations of 0.09 sq. metre areas in each plot before the spring treatments, and at intervals after application on both spring- and fall-treated plots. The final assessment in the 1956 season was made on Sept. 25, when shoot counts of leafy spurge, estimates of control, and notes on condition of grasses and spurge were taken. Results: A first report of the spring treatments was given on page 21, Research Report, NCWCC, 1955. In 1956, the control estimates for the spring treatments closely approximated the results obtained by actual shoot counts taken Sept. 25/56, and therefore the estimates only are presented below for both spring and fall applications.

Material	Rate	% Control (Sept. 25/56) Treat. May 10/55	Treat. Oct. 13/55
Sodium chlorate	2 lb./100 sq. ft.	60	70
Polybor-Chlorate	2 lb./ "	65	*
Concn. Borascu	3 lb./ "	78	88
Ureabor	3/4 lb./ "	0/	0/
"	$1\frac{1}{2}$ lb./ "	*	70
DB Spray	1 lb./ "	*	99/
"	2 lb./ "	100-	*
DB Granular	1 lb./ "	*	99
"	2 lb./ "	98	100-
2,4-D	24 lb./acre	*	88
"	48 lb./ "	*	97

* No treatment made

None of the treatments gave 100% control persisting for a 12-month period. The spring applications of DB Spray and DB Granular had given excellent control though not complete eradication; only fair control resulted from the use of sodium chlorate, Polybor-chlorate, and Concn. Borascu; and Ureabor at the rate used was of no value. Approximately one year after application, the corresponding fall treatments of the above materials had given about the same degree of control. In addition, Ureabor at $1\frac{1}{2}$ lb. had given fair control and the DB materials at 1 lb. had given excellent control. Very good control of spurge resulted from fall application of the ester of 2,4-D at 48 lb./A. There is some evidence that, at equal rates, DB Spray is slightly superior to DB Granular. The grasses had been badly killed by sodium chlorate and Ureabor, and were reduced by Polybor-chlorate. None of the other materials caused more than a slight degree of injury to the grasses. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.)

Russian Knapweed

Effectiveness of ATA, TBA and 2,4,5-TP for eliminating Russian knapweed growing in crested wheatgrass sod. Derscheid, Lyle A. Triplicate 1-rd. by 3-rd. plots of Russian knapweed growing in crested wheatgrass sod were sprayed with ATA at 6, 8 and 10 lb./A., 2(2,4,5-TP) at 10, 15 and 20 lb./A., 2,3,6-TBA at 2, 4 and 6 lb./A. and an ester of 4(2,4-DB) at 10 lb./A. in 40 gal./A. of spray on June 1956 when the weeds were 8 to 10 inches tall. By August 15, it appeared that the 6 lb./A. rate of TBA had killed 80-90% of the knapweed. One month later, however, there was regrowth. The results indicate that none of these treatments were satisfactory. (Contributed by the Agronomy Department, South Dakota State College College Station, Brookings, South Dakota).

Effectiveness of TBA, ATA and 2(2,4,5-TP) for eliminating Russian knapweed when applied before the seed bed was prepared for corn. Derscheid, Lyle A. Duplicate 1-rd. by 3-rd. plots of Russian knapweed were sprayed with ATA at 4, 6 and 8 lb./A., 2,3,6-TBA at 1, 2 and 4 lb./A. and 2(2,4,5-TP) at 10 and 20 lb./A. in 40 gal./A. of spray on May 26, 1956 when the weeds were six inches tall. On June 6 the weeds were plowed under, the seedbed prepared and corn was planted. On July 3, it appeared that all rates of TBA had killed over 75% of the weeds and both rates of 2(2,4,5-TP) in one replicate had eliminated over 80% of the weeds. By August 15, it was apparent that none of the treatments were satisfactory except the 4 lb./A. rate of TBA. On September 19, this treatment still appeared to have elimin-

ated over 90% of the weeds. (Contributed by the Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota).

Effectiveness of erbon, Ureabor and Chlorea as soil sterilants on Russian knapweed. Derscheid, Lyle A. Duplicate 9-ft. by 15-ft. plots were treated July 20 and September 17, 1955. Erbon was applied at rates of ½ and 1 lb./sq. rd. of active ingredient, while Chlorea and Ureabor were applied at rates of 2½, 5, and 7½ lb./sq. rd. of product. Estimates of the percentage kill were made May 26, 1956. They are given in the following table.

Chemical	Lb./sq. rod	Percent Elimination July	Percent Elimination Sept.
Erbon	½	80	99
"	1	99	99
Ureabor	2½	0	20
"	5	25	70
"	7½	30	95
Chlorea	2½	75	97
"	5	97	97
"	7½	99	99

These results indicate that all three chemicals were more effective in September than in July. One lb./sq. rd. of Erbon was required to give satisfactory kills in July, but one-half lb./sq. rd. was sufficient in September. Likewise 5 lb./sq. rd. of Chlorea were effective in July but only 2½ lb./sq. rd. were required in September. None of the Ureabor treatments during July were satisfactory, but 7½ lb./sq. rd. gave 95% elimination when applied in September. These are the results of only one experiment and are not conclusive, but do give an indication of what might be expected of these chemicals. (Contributed by Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota.)

The effect of herbicides on Russian knapweed (Centaurea repens). McCurdy, E. V. A small field of Russian knapweed growing in competition with bromegrass was divided into replicated plots 10 feet square. During the past five years the stand has been thinned with repeated applications of 2,4-D at 2 lb./A. but in no case has all growth been eliminated. DB Spray powder at both 2 lb./100 sft. and 3 lb./100 sft. have resulted in an excellent reduction. DB Granular at the same rates removed practically all Russian knapweed and the few remaining plants were unthrifty. The bromegrass was injured slightly but adequate growth remained to offer considerable competition to any weed seedlings. Polybor chlorate at 3 lb./100 sft. resulted in a marked reduction in the number of plants but the brome was more severely thinned than with the previous chemicals. Heyden 1281 (trichlorobenzoic acid) applied at 10 lb./A. in 1955 completely eradicated all plants. When this chemical was applied at 2 lb./A. this year regrowth appeared quite normal but at 4 pounds the plant count was reduced by about 50%. Weedazol (Amino triazole) applied at 8 lb./A. removed all bromegrass but the Russian knapweed was making normal growth this fall. Ureabor at 2 lb./100 sft. resulted in a marked reduction and at 3 lb./100 sft. the few plants remaining were weakened and quite yellow. (Contributed by the Experimental Farm, Indian Head, Sask., Canada).

TOADFLAX AND OTHER PERENNIAL HERBACEOUS WEEDS

Summary H.A. Friesen

Twelve abstracts were received dealing with cultural and chemical studies for the control of toadflax in Saskatchewan and Alberta. Keys reporting on seven-year's work stated that extensive infestations on arable land were reduced by 95% by the use of a rotation of alternate fallow (intensively cultivated) and grain. Two consecutive years of intensive tillage of fallow did not improve the control obtained, while two consecutive crops of grain permitted rapid recovery of the weed in the stubbled-in crop. Fall plowing was superior to shallow tillage in reducing the infestation on the stubbled-in crop. Permitting green regrowth for 7 days between tillage operations on fallow was as effective as keeping the surface entirely black and required fewer operations. The substitution of 2,4-D ester at 2 lb/A or amine triazole at 8 lb/A was no more effective than tillage alone. Carder reports that intensive tillage prior to seeding down to a strongly competing grass, such as brome, has over the past four years, reduced the toadflax stand by 97%. Spraying the grass in each of these years did not give complete eradication. Creeping red fescue used in a similar way resulted in 86% control without the spraying and 97% with spraying.

Trials with various herbicides were reported. Borate-2,4-D complex (DB) and Concentrated Borascu were the most outstanding. At dosages of 2 to 3 lbs/100 sq. ft. each compound gave essentially complete toadflax control with only slight injury to grass growing on these plots or to wheat seeded on the treated areas. the following year. Ureabor at these rates killed both the weed and the grass. CMU at dosages of 40 to 80 lbs/A resulted in estensive soil sterility - five years in one trial. 2,4-D ester at dosages of 35 and 57 lbs/A gave 95% control when fall applied in Saskatchewan and less than 50% control when spring applied. In a trial in Alberta, June applications of 2,4-D ester at 40 lbs/A were much superior to fall application. Amino triazole applied at 8 to 16 lbs/A in the spring and retreated in the fall resulted in 92 and 98% control the following year. Tillage one day after the final treatment reduced its effectiveness.

Wild garlic - one abstract from Indiana reported 90% control of new and 50% control of old growth with 5 and 10 lbs/A amino triazole. 2,2-dichlorobenzoic acid at these rates resulted in a corky condition of the underground bulbs. CMU, TCA, dalapon and trichlorobenzoic acid gave no control.

Field horsetail was treated at full vegetative growth with Dalapon, ATA and 2, 3, 6-TBA at 5 and 10 lbs/A; with 2,4,5-T ester, 2,4-D butyl ester, 2,4-D amine and three formulations of MCPA each at 4 and 8 oz/A. Each treatment gave complete top growth kill except Dalapon, 2,3,6-TBA and 2,4-D amine. Further work from Alberta points out that best top-growth control was realized if spraying with 2,4-D and MCPA was done when the shoots had attained full growth.

Poverty weed in Saskatchewan was not controlled by 2,4-D ester at 40 oz/A applied in the fall of 1955.

Bladder campion in Minnesota was 96% controlled with Geigy 444 at 4 lb/A. Red clover was only 10% injured. 30 - 45% control with 10 - 20% injury to clover resulted from treatment with 2,4-D acetamide and MCPB. DB granular and polychlorobenzoic acid gave good control but killed the clover.

Horse nettle in corn was 80 - 90% killed by 2,4,5-T at 3 lb/A, 2,4,5-T at 2 lb/A mixed with CMU at 2 lb/A, 2,3,6-TBA and amino triazole with no reduction in corn yield. 2,4-D ester gave no control.

Asinth was controlled 75% by ATA, TBA, borascu, DB granular and chlorea. 2,4-D, MCP and 2,4,5-T at dosages of 2 lb/A had little effect.

Abstracts of Results of Co-operators

The use of ATA alone and combined with tillage for the control of toadflax. Carder, A.C. On June 1, 1956, different rates of ATA were applied in 40 gal/A aqueous solution by hand-boom sprayer to a continuous infestation of toadflax when 3 - 4 in. high or at late rosette. On August 1 when about 2 in of regrowth had occurred half of each plot was retreated with the same dosage as used at the initial application. One day later one series of plots was one-wayed 5 in. deep on the half-lap, while the remaining series was left undisturbed. The effectiveness of the various treatments was appraised in mid-September. Results are as follows:

	ATA active lb/A.	Percentage Topgrowth Survival ≗ No Retreatment	Percentage Topgrowth Survival ≗ Retreatment
No cultivation	8#	32	8
	12	40	5
	16	22	2
Cultivation	8	60	42
	12	32	25
	16	18	15

≗ Arbitrary units.
\# Av. duplicate plots.

The data indicate that cultivation did not generally increase the effect of the chemical, while retreatment induced considerable additional control, especially where tillage was not employed. The reason why tillage reduced the effect of the herbicide where retreatment was given is undoubtedly due to the fact that the plants were turned under 24 hours after receiving the chemical.

The data show that two 16 lb/A applications of ATA had not completely killed all top growth by mid-September. Where only a single application had been given and where no tillage had been employed many of the surviving toadflax plants recovered sufficiently to produce seed. Final results will not be known until 1957. (Contributed by the Experimental Farm, Beaverlodge, Alta.)

<u>Control of toadflax by 2,4-D in combination with a competative grass</u>. Carder, A.C. An area heavily infested with toadflax was partially fallowed in 1952, fitted for seeding in the spring of 1953 when one-half of the area was sown to creeping red fescue and the other half to brome. Good stands of grass were obtained along with a considerable growth of toadflax consisting of seedlings and resprouts from established plants. No nurse-crop was used with the grasses. In the summers of 1953 through to 1956 when the toadflax was in late bud the butyl ester of 2,4-D was applied at nil, 1, 2, 3 and 4 lb/A acid in aqueous solution at 5 gal/A. Appraisal of toadflax suppression was made in the fall of each year treatment was carried out. Results are as follows:

Grass inclusion	2,4-D acid lb/A	Percentage Survival ± of Toadflax 1953	1954	1955	1956
Creeping red fescue	Nil	80.0#	50.0	22.0	13.8
	1	72.0	34.0	9.8	6.0
	2	64.0	25.5	9.2	3.8
	3	32.0	14.0	7.8	3.2
	4	24.0	10.0	7.0	2.8
Bromegrass	Nil	80.0	40.0	10.2	2.5
	1	48.0	29.6	5.8	2.5
	2	40.0	24.4	5.8	2.5
	3	24.0	12.8	2.8	1.0
	4	24.0	8.8	2.0	0.8

± Arbitrary units by same appraiser.
\# Av. quadruplicate plots.

The data indicate that: 1) Considering the virtually complete stand of toadflax which established itself in the summer of 1953, the grasses have offered over the course of time heavy competition even without the application of 2,4-D. Brome seems particularly aggressive. 2) The additional suppressive effect of the 2,4-D treatments on the toadflax were at first quite marked but decreased in subsequent years. 3) No treatment eradicated the toadflax although bromegrass combined with 3 or more lb/A of 2,4-D almost achieved this result. It was also noticed that wherever one or more pounds of 2,4-D had been applied no viable toadflax seed was produced in any year. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

<u>Further observations of the effect of borax compounds on toadflax, 1956.</u> Coupland, R.T., G.W. Selleck and S. Zilke. Numerous 10 x 10 ft. plots of toadflax on sandy-loam soil were treated near Hague, Sask. with polybor-chlorate (73% borates, 25% sodium chlorate) at rates from ½ to 3 lb. and Concentrated Borascu

(61.5% B_2O_3) at rates from 1 to 7 lb. active ingredient per 100 sq. ft. in Sept., 1953 and in May, 1954. Complexes of sodium borate (41% and 60%) and 2,4-D (7%) were also applied at the latter date at 1, 2 and 3 lb/100 sq. ft. All of the rates of Conc. Borascu and one rate of polybor-chlorate (½ lb. per 100 sq. ft. on one plot) which were applied in 1953 maintained a minimum of 99% control in September, 1955. All plots (with the exception of one) which were treated in 1953 contained some regrowth of toadflax. The highest percentage of control was attained with the lower rates used (Conc. Borascu at 1 to 4 lb.; polybor-chlorate at ½ to 1 lb/100 sq. ft.) and was associated with the highest percentage regrowth of grass. The highest rates of application resulted in a lower percentage survival of the grass. The maintenance of competition provided by grass (in addition to inhibition of weed growth) appears to contribute to the effectiveness of soil sterilants in the control of toadflax. Certain plots of all three chemicals which were applied in 1954 maintained 100% control of toadflax in Sept., 1956, while in others, control ranged from 75% to 99%. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

<u>The effect of heavy applications of 2,4-D amine on persistent perennial weeds, 1956.</u> Coupland, R.T. and G.W. Selleck. 2,4-D amine was applied to toadflax (near Hague) and to leavy spurge (near Saskatoon) at rates of 35, 70 and 105 lb. of active ingredient per acre on plots 16 x 100 ft. in May, 1955. The intermediate rate was applied to leafy spurge in July. The chemical was again applied to both species in September at rates of 57, 113 and 170 lb. acid equivalent per acre. The 2,4-D applied in May provided less than 50% control of both species, while all of the fall applications provided 95% control or better in June, 1956. By September, the percentage of control of both species by fall treatments had deteriorated to 85% at the heaviest rate of application. Control was less effective at lower rates. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

<u>Effect of date of application of 2,4-D and DB granular on the control of toadflax.</u> Friesen, H.A. 2,4-D butyl ester at 10, 20, 25, 30 and 40 lb/A was sprayed on toadflax at 5 dates, viz: 1) September 18, 1954, three days after the first killing frost of the season; 2) June 8, 1955, during the early flower stage; 3) August, 1955, first seed pods had formed; 4) September 6, 1955, which was 2 days prior to the first killing frost of 1955; and 5) September 20, 12 days after the first killing frost. DB granular at 1/6, 1/3 and 1 lb/100 sq. ft. was applied at dates 4 and 5. The toadflax was growing on a roadside which had a sparse covering of brome and native rass. <u>Results:</u> The effect of date of application of 2,4-D was quite striking in that each plot treated on June 8, 1955 with a dosage of 20 lb/A or higher had less than 5% regrowth of toadflax during 1956. Heavy dosages of 2,4-D applied at the other 4 dates had upwards of 60% regrowth.

DB at 1 lb/100 sq. ft. applied in September, 1955 but prior to a killing frost showed 40% regrowth while the same treatment applied after this frost had less than 10% regrowth. DB at the

1/6 and 1/3 lb/100 sq. ft. rates resulted in unsatisfactory control at each of dates 4 and 5. (Contributed by the Experimental Farm, Lacombe, Alta.)

Combinations of chemical and cultural treatments of fallow for toadflax (Linaria vulgaris) control. Keys, C.H. Alternate tillage and spraying of fallow in a two year rotation of fallow and wheat has been used in comparison with tillage practices described in a separate abstract. After initial tillage in the spring the fallow plot was divided into five-sub-plots and when regrowth permitted, weedazol (3 Amino 1, 2, 4 triazole) was applied at 2, 4, 6 and 8 lbs/A, and a combination of weedazol and 2,4-D (2, 4-Dichlorophenoxyacetic acid) ester were each applied at 2 lbs/A. When further regrowth appeared tillage was resumed. Weed scores taken after removal of the crop in this rotation indicated that this type of treatment was not successful. The reduction of toadflax from the beginning of the rotation amounted to 64%. This was some 34-36% less than fallows receiving tillage only. Crop yield was not reduced as a result of the chemical treatments. Soil sterilants at relatively light rates, applied as a tillage substitute delayed the crop and reduced the yields. (Contribution from Experimental Farm, Scott, Sask.)

Cultural treatments of fallow and stubble for toadflax (Linaria vulgaris) control. Keys, C.H. Fallow treatments for control of toadflax have included (1) black fallow or intensively tilled fallow (2) fallow tilled at intervals that allowed top growth to appear for about one week. (3) initial spring tillage with the one-way and (4) initial spring tillage with the plough. Post-harvest treatments of stubble have included: (1) plough (2) cultivate (3) blade weed and (4) no cultivation. Results this year again indicated that there was little to choose between black fallow and fallow tilled when regrowth had been in evidence for about one week. Both methods reduced the toadflax stands by 96-98%. There was very little difference in weed control due to the initial spring tillage treatments. The regrowth after ploughing was less than after one-waying but the end results seemed to be about equal. In most years however, fewer tillage operations have been required following a ploughing operation. Post-harvest tillage treatments prior to fallowing have shown some beneficial influence in reduction of weed growth as well as crop yield. The results are as given in the following table:

Treatment	Wheat on Fallow		Barley on Stubble	
	Yield 1956	% weed Reduction	Yield 1956	% Weed Reduction
No tillage	38.1	89	73.2	-12
Plough	56.4	95	51.0	- 4
Cultivate	57.3	92	44.0	- 9
Blade weed	58.6	92	44.6	- 9

Post-harvest tillage treatment on stubble to be cropped as second

time resulted in slightly decreased yields but the increase in weed population was not marked. (Contribution from Experimental Farm, Scott, Sask.)

Comparison of borate compounds for control of toadflax (Linaria vulgaris) in creasted wheatgrass (Agropyron cristatum). Keys, C.H. Concentrated borascu, DB Granular (borate, 2,4-D) and Ureabor (borate, CMU) were applied at $\frac{1}{2}$, 1, 2, 3, 4 and 6#/100 sq. ft. in a quadruplicate and randomized series of plots in early May, 1956. All applications were made in the dry state. The grass was an even stand and the toadflax was just starting to send out new shoots. Observations during the season indicated that all treatments at 1# and higher gave good control of the top growth of toadflax, the $\frac{1}{2}$# rates did not provide complete control but the growth of the plants was retarded. The 2, 3, 4 and 6# rates of Ureabor caused heavy grass damage (80-100%). There was some damage to the grass with the $\frac{1}{2}$ and 1 pound rates as well. DB was less severe in its action than Ureabor but there was evidence of grass damage at the 2 lb. rate while the 4 and 6 lb. rates completely killed the grass. It was noted however, that Russian thistle was replacing the grass in all plots treated with DB. Concentrated borascu controlled the toadflx very effectively from the 2 lb. rate and up, and grass damage was evident at the 4 and 6 lb. rates only. There was some survival of toadflax at the $\frac{1}{2}$ and 1 lb. rates. In view of the above normal precipitation received during the season, it was felt that the chemical was more active than under normal climatic conditions. (Contribution from Experimental Farm, Scott, Sask.)

Rotational practices for toadflax (Linaria vulgaris) control. Keys, C.H. A rotation of alternate fallow and grain has been compared with two years of fallow and grain; three years fallow and grain and fallow, grain, grain rotations. Weed scores have indicated that the additional reduction in weed stand provided by two or three years of fallowing has not been practical and at times hazardous if practiced over large acreage. Post-harvest weed scores revealed that 2 - 3% of toadflax survived after three years fallow and one crop. This was virtually the same degree of control as two years of fallow and crop. Although there has been considerable improvement in the control of toadflax in the second crop after fallow due mainly to thorough tillage operations and delayed seeding, weed scores showed that there was, this year, a 12% increase in toadflax on land not receiving fall tillage, 9% on black weeded stubble and 4% on ploughed stubble. Stubble crop yield was reduced due to the post-harvest tillage practices but the reduction was not extensive. (Contribution from Experimental Farm, Scott, Sask.)

Effect of herbicides on control of toadflax (Linaria vulgaris). Keys, C.H. Over the past six years a number of herbicides have been applied to heavy infestations of toadflax at various rates. Observations made during the year of the first of such plots layed out in 1951 indicated that the sterilizing effects of CMU at the 40, 80 and 100 lb/A rates had not diminished in any way. DNOBSP at 10 lb/A with a heavy application of fuel

oil was still keeping the soil completely sterilized. Applications of CMU and 2049 (thought to be 3-(3,4-dichlorophenol)-1, 1-dimethylurea) at 20, 40, 80 and 100 lb/A respectively made in 1953 were still providing complete sterility at the two heavier rates. There was some patchy crop growth at the 20 and 40 lb/A rates. Growth on plots treated with atlacide and polyborchlorate at 2.5, 5 and 7.5 lbs/Sq. rod in 1953 was returning to normal this year. Todaflax, although not as dense as the original stand was making progress in all of these plots. Applications of 2,4-D ester at 20, 25 and 40 pounds per acre in 1954 still had a depressing effect on a heavy stand of toadflax that has not been disturbed for several years. (Contribution from Experimental Farm, Scott, Sask.)

<u>Comparison of various chemical sprays for control of toadflax</u>. Vanden Born, Wm., and Wm. G. Corns. On June 16, 1955 plots of toadflax were sprayed with the following preparations: Sodium Chlorate 2, 4 lb. per 100 sq. ft.; CMU, Karmex DW, Karmex FW, 50, 100 lb/A; DB spray (Borate - 2,4-D compd.) 2, 4 lb. per 100 sq. ft.; 2,4-D-ester 61, 122 lb/A; Amino triazole 7½, 15 lb/A. All chemicals and rates were effective in killing top growth within a few weeks. (Abstract 1955). The area was seeded to spring wheat in May, 1956. Observations were made on July 20 and September 19. Plots treated with CMU, Karmex DW, and Karmex FW, Sodium Chlorate, DB spray 4 lb/A had no growth, except for a few stunted wheat plants on the 2 lb/A Sodium Chlorate plot. DB spray at 2 lb/A gave excellent toadflax control, and showed little or no effect on the wheat. 2,4-D at both rates gave unsatisfactory control. Amino triazole gave some control at 7½ and 15 lb/A. Excellent control was observed on one 15 lb/A plot. There was no visible residual effect on wheat from this chemical. (Division of Crop Ecology, Dept. of Plant Science, University of Alberta.)

<u>Comparison of granular DB, dry ureabor and CMU spray on toadflax</u>. Vanden Born, Wm., and Wm. G. Corns. Toadflax was in bloom on August 10, 1955, when these chemicals were applied: Ureabor 2, 4 lbs. per 100 sq. ft. CMU spray 33, 66 lbs. per acre (equiv. to CMU content in Ureabor). DB granular 2, 4 lbs. per 100 sq. ft. (Abstract 1955). Observations in July and September, 1956 indicated 100% kill of toadflax on Ureabor and DB plots. Ureabor plots were practically black, while the 4 lbs. rate of DB also had a strong residual effect on barley seeded in 1956 (leaf burning). CMU at both rates gave 95% kill of toadflax, and prevented any growth of barley. (Division of Crop Ecology, Dept. of Plant Science, University of Alberta.)

<u>Treatment of wild garlic with several chemicals</u>. Rogers, B.J. and R.D. Hart. On Nov. 25, 1955, wild garlic (<u>Allium vineale</u>) growing in a wet, clayey soil in southern Indiana was sprayed with: 3 and 6 lbs/A of CMU; 4 and 8 lbs/A of polychlorobenzoic acids (duPont); 10 and 20 lbs/A of TCA, sodium salt; 5 and 10 lbs/A of 2,2-dichloropropionic acid, sodium salt (Dalapon); 5 and 10 lbs/A of amino triazole; and 5 and 10 lbs/A of 2,2,3-trichloropropionic acid, sodium salt. The garlic ranged in age from new seedlings to older plots 1 ft. in height. Ratings made

on April 5, 1956, indicated (1) about 50% control of older plants and 90% control of new growth at both rates of amino triazole; (2) a "corky" condition of underground bulbs from both rates of polychlorobenzoic acids; and (3) no control from the other chemicals. Ratings made on September 26, 1956, indicated no apparent control from any of the treatments. (Contribution by the Dept. of Bot. and Plant Path., Purdue Univ. Agric. Expt. Sta., Lafayette, Indiana.)

Effect of various herbicides on field horsetail, hemp nettle, wild oats and alfalfa. Hoyt, P.B. On July 11 a number of herbicides were knapsack sprayed in water solution at the rate of 40 gal/A to field horsetail, Equisetum arvense, at full vegetative growth; hemp nettle, Galeopsis tetrahit, at flower; wild oats at milk and alfalfa at flower. Top-growth kill estimates were made 3 weeks after application of the herbicides. Results are shown in the table.

Herbicide	Rate/ acre active ingredient	Percent Top-Growth Kill: Field Horsetail	Hemp Nettle	Wild Oats	Alfalfa
Dalapon	5 lb.	0*	8	0	0
"	10 "	4	12	5	13
ATA	5 "	100	87	45	93
"	10 "	100	100	93	100
2,3,6-TBA	5 "	32	5	0	53
"	10 "	58	30	0	67
2,4,5-T (ester)	4 oz.	100	10	0	60
"	8 "	100	48	0	83
2,4-D (amine)	4 "	40	3	0	3
"	8 "	63	3	0	8
2,4-D (butyl ester)	4 "	100	0	0	18
"	8 "	100	10	0	45
MCPA (amine)	4 "	100	0	0	3
"	8 "	100	20	0	13
MCPA (butyl ester)	4 "	100	0	0	5
"	8 "	100	0	0	17
MCPA (sodium salt)	4 "	100	0	0	3
"	8 "	100	15	0	13

* Av. triplicate plots.

The data indicate that ATA, 2,4,5-T, 2,4-D butyl ester and all 3 formulations of MCPA gave complete to-growth kill of field horsetail. For some reason 2,4-D amine was less lethal to this weed. ATA also gave excellent top-growth kill of hemp nettle, wild oats and alfalfa. 2,4,5-T gave a better kill of hemp nettle than did any of the 2,4-D and MCPA formulations. Dalapon was generally the least effective of all the herbicides in promoting top-growth kill of the four types of plants. 2,3,6-TBA did no apparent injury to the wild oats and only partially injured the other plant species. (Contribution of Experimental Farm, Beaverlodge, Alta.)

Effect of 2,4-D and MCPA on field horsetail and yield of barley. Hoyt, P.B. The chemicals were knapsack-sprayed at nil, 4, 8, 12 and 16 oz/A acid equivalent to 3 growth stages of the sterile shoots of field horsetail, *Equisetum arvense*, for 3 consecutive years beginning in 1954. Each year's treatments were applied to fresh stands of horsetail in contiguous areas. In all 3 years of the experiment, the growth stages of the horsetail when the different treatments were made were: first, 70% had emerged and growth was 5 - 6 in. tall; second, all the horsetail had emerged and was 11 - 15 in. tall; third, all the horsetail had emerged and was 15 - 20 in. tall. As shown in the table, the three years' data accentuate the importance of allowing all the horsetail plants to emerge and to reach full growth to obtain maximum to-growth kill. On the basis of 3-year averages, neither chemical at any rate gave 100% top-growth kill when applied at the first stage. At the second stage, 100% kill was obtained with the 12- and 16-oz. rates of 2,4-D and with the 8-, 12- and 16-oz. rates of MCPA. At the third stage, 100% kill was obtained by all rates of both chemicals.

Rate oz/A	Percent top-growth kill of field horsetail					
	70% emerged 5-6 in. tall		100% emerged 11-15 in. tall		100% emerged 15-20 in. tall	
	2,4-D	MCPA	2,4-D	MCPA	2,4-D	MCPA
4	19.9*	48.8	92.3	98.3	100	100
8	41.7	60.5	97.2	100	100	100
12	54.4	61.9	100	100	100	100
16	57.4	68.4	100	100	100	100

* Av. 3 years' data from triplicate plots.

In the 1956 test, 8, 12 and 16 oz/A of 2,4-D significantly lowered the yield of barley compared with the same rates of MCPA. Where 4 oz/A of either chemical were applied no difference in the effect on the yield of barley occurred. The barley was in the 4 - 5-leaf, late shot-blade and early-milk stages of growth at time of the first, second and third application, respectively. Barley when treated at early milk significantly outyielded barley treated at the other two stages. In the 1954 and 1955 tests, applications made at time of flowering significantly lowered yields as compared to applications made at pre-flower or post-flower stages. Horsetail and barley considered, 3 years' results indicate that the best treatment for top-growth kill of horsetail and least injury to barley occurred when 4 and 8 oz/A of MCPA were applied after the weed had completed emergence and the barley was either in late shot-blade or early milk. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

Poverty weed control (*Iva axillaris*). Best, K.F. During the fall of 1955, a series of thirteen plots were set out on a poverty weed infested area on the irrigated heavy clay land at Val Marie. The size of the plots were 10 feet wide and about 90 feet long. The treatments involved the application of 2,4-D ester at rates of 10, 20 and 40 ounces per acre on two replicates.

There were also two plots on which farmmanure had been applied, each separated from the treated areas by buffer plots. The layout was completed by the inclusion of two check plots. Following treatment, the entire area was cultivated across the plots and in the following spring the land was seeded to wheat.

Inspection on the 14th of August failed to show any visable differences between the stand of the weed on any of the treated areas and that found on the check plots. (Contributed by Experimental Farm, Swift Current, Sask.)

Comparison of various herbicides for control of bladder campion (*Silene cucubalis*) in red clover. Blanchard, K.L. and R.S. Dunham. A moderate, but uniform infestation of bladder campion, growing in a 3-year old red clover field near Baudette in extreme north-central Minnesota, was treated June 26, 1956, with (1) DB granular at 2.0, 3.0 and 5.0 lb/Sq. rod, (2) amino triazole at 0.75, 1.0 and 1.25 lb/A, (3) CMU at 1.0, 1.5, and 2.0 lb/A (4) 2-chloro-4,6-bis (diethylamino)-S-triazine (Geigy 444) at 1.0, 2.0 and 4.0 lb/A, (5) polychlorobenzoic acid at 2.0, 4.0 and 6.0 lb/A, and, (6) 2,4,5-T acetamide, (7) 2,4-D acetamide, (8) 2,4-D butyric, (9) MCP butyric, all at 1.0, 2.0 and 3.0 lb/A. Bladder campion was from 16-20-inches high and just starting to bloom, while the red clover was 4-6 inches high and actively growing. Duplicate square rod plots were used for each treatment level and all plots were randomized. Observations and evaluations were made on July 17 and July 25, and the Results of the final evaluation are as follows: 96% control resulted from (4) at 4.0 lb. rate with 10% injury to red clover; 30 - 45% control, with 10 - 20% red clover injury, resulted from (7) and (9) at the highest rates; good control but severe crop injury resulted from (1) and (5). (Contribution of Minnesota Dept. of Agric. and the Dept. of Agronomy and Plant Genetics, Institute of Agric., University of Minnesota, St. Paul, Minn. Paper No. 3668. Scientific Journal Series, Minn. Agric. Exp. Stn.)

Comparison of various herbicides for control of horse nettle (*Solanum carolinense*) growing in corn. Blanchard, K.L. and R.S. Dunham. A heavy infestation of horse nettle growing in corn near Henderson in south-central Minnesota was treated June 28, 1956, with (1) 2,4,5-T ester and (2) 2,4-D ester, both at rates of 1.0, 2.0 and 3.0 lb/A. (3) amino triazole at 4.0, 6.0 and 8.0 lb/A, (4) 2,4,5-T ester plus CMU at 1.0 + 0.5, 2.0 + 0.5 and 3.0 + 0.5 lb/A and (5) 2,3,6-TBA at 2.0, 4.0 and 6.0 lb/A. Corn was past the usual "lay-by" stage and ear formation was beginning. Spray received by corn plants only to a 6-inch height above the ground. Duplicate plots each consisting of 4 rows, 1 rod long, were used for each treatment level and all plots were randomized within the experimental area. Soil moisture was adequate before and during the trials. A heavy rain of 1.75 inches fell 40 hours after application. On September 4, observations were taken as to the control of the horse nettle, and on October 9 the corn was harvested from each plot and yield determinations made. Treated plot yields were compared with those

of the checks. Results: 80 - 98% reduction in stand resulted from (1) at 3.0 lb (3) at 2.0 + 0.5, (4) at 6.0 lb. and (5) at 6.0 lb. No control from (2). No reduction in yield was evident from any treatment. Further evaluation of possible population reduction will be taken in the late spring of 1957 on the basis of regrowth. (Contribution of Minnesota Dept. of Agric. and the Dept. of Agronomy and Plant Genetics, Institute of Agric., University of Minnesota, St. Paul, Minn. Paper no. 3669. Sci. Jour. Series, Minn. Agriculture Experimental Station.)

Chemicals for controlling absinth. Molberg, E.S. A number of chemicals were applied at fairly high rates to absinth (artemesia absinthis) to determine which might be useful in controlling the weed. The plots were 100 sq. ft. in size and were not replicated. The weeds were mowed before treatment, mowing in itself gave a considerable measure of control. 2,3,6-TBA at 8 lb/A, ATA at 16 lb/A, anhydrous borax (concentrated borascu) at 60 lb/A, a borate, monuron mixture (chlorea) at 60 lb/A, and a borate, 2,4-D mixture (DB granular) at 60 lb/A all gave 75% or more control, and further testing should be done with these chemicals. Different formulations of 2,4-D, MCP and 2,4,5-T at rates up to 2 lb/A had very little effect on absinth, and results from these were not satisfactory. (Contributed by the Dominion Experimental Farm, Regina, Sask.)

Johnsongrass and Bermudagrass

O. Hale Fletchall

Summary

Bermudagrass

Plowing 10 days after treatment with 10 lb/A. dalapon left only a trace of Bermudagrass and some crops recovered from dalapon injury when planted on this land 35 days after treatment. TCA was not as effective as dalapon. No plowing and plowing before treatment were less effective than plowing after treatment.

Johnsongrass

Satisfactory control in the year of treatment was obtained with as little as 10 lb/A. dalapon in either single or split applications. Three weekly treatments of 3 lb/A. dalapon each (totaling 9 lb/A.) were more effective on regrowth after cutting than on early growth. Control in the year after treatment from 20 and 30 lb/A. dalapon was slightly less than that from fallowing by disking. In one case 15 lb/A. dalapon followed by two cultivations gave only 50% control in the year following treatment. TCA required a rate about four times that of dalapon for equal effectiveness and at effective rates residual effects on crops were more damaging from TCA. Two hand sprayings of dalapon on Johnsongrass in corn gave 90% control of the Johnsongrass and a 40% increase in corn yield in spite of some dalapon injury to the corn.

Early summer applications of several soil sterilants were more effective than late fall applications.

Several chemicals that have shown promise for pre-emergence control of annual weedy grasses failed to control Johnsongrass seedlings.

In one case fallow by disking resulted in 70-90% control the following year while in another case tillage every 4 weeks with a sweep plow gave 99.5% control.

Abstracts reporting control the year following chemical treatment tended to reflect less favorable results than those reporting control in the year of treatment.

Abstracts Bermudagrass

Control of Bermudagrass with TCA and dalapon in combination with cultivation. Elder, W. C. In a well established stand of Bermudagrass, plots 14 x 99 Ft were treated with 10 and 20 lbs TCA/A and 5 and 10 lbs dalapon/A on April 30. New grass growth had completely covered the area at this date. One third of the area was plowed in January previous to treatments and one third of the area was plowed and seedbed prepared 10 days after the first treatment. The land plowed in January was disked and a seedbed prepared May 9. Fourteen summer crops were planted in one-foot rows in each cultivated area on June 4. One-half of the cultivated area was reserved for a repeat treatment of the chemical on June 4 at the same rate as on April 30. One-half of the non-cultivated area was also retreated. The same crops were planted again June 29 in the cultivated area treated the second time. Supplemental irrigation was given to equal normal rainfall. Results; Dalapon was more effective than TCA for Bermuda grass control in this test. 5 lbs dalapon/A was equal to 20 lbs TCA/A treatments. Plowing 10 days after treatment was much superior to plowing before treatments, or where

no cultivation was given. Only a trace of Bermudagrass was observed in plots treated with 10 lbs dalapon/A followed by cultivation. Where the second treatment was made with 10 lbs dalapon/A the Bermudagrass seems to be completely eradicated. 5 lbs dalapon/A did not injure crops. 10 lbs TCA/A affected soybeans, cowpeas, peanuts and lespedeza. 10 lbs dalapon/A showed some injury to corn, sorghum, sudan and millet when small but they soon recovered from the first treatment. Dalapon caused less injury to legumes than TCA. (Contribution of the Agronomy Department, Oklahoma Experiment Station.)

Abstracts Johnsongrass

Chemical control of Johnsongrass. Anderson, L. E. Of chemicals used in the 1955 foliar application study for control of Johnsongrass (Sorghum halepense), dalapon (2,2-dichloropropionic acid), and erbon (2 - (2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate) appeared promising. Consequently more information relative to the performance of these herbicides was desired. Variables included in the 1956 study were rates, dates of application, and repeat treatments. Rates for dalapon included 10 and 20 lbs/A as single foliar applications, and 5 and 10 lb/A applications at the six-inch stage of growth followed by a second application at the same rate two weeks later. The 10 and 20 lb/A applications were made at 6 in, 12 in and 24 in stages of growth. Dalapon was also used in combinations with amino triazole (3-amino-1,2,4-triazole) and maleic hydrazide (1,2 dihydropyridazine-3-6 dione). Erbon was applied at rates of $\frac{1}{4}$, $\frac{1}{2}$, and 1 pt/sq rd at the 6 in, 12 in and 24 in stages of growth. Other treatments included were CDAA (2-chloro-N, N-diallyl acetamide) 5, 10, and 15 lbs/A; CDEC (2-chloroallyl - diethyldithio carbamate) 5, 10, and 15 lbs/A; TCB (2,3,6-trichlorobenzoic acid) 1, 2, and 4 lbs/A; sodium 2,2,3-trichloropropionate, 20 lbs/A; and 3 Y 9 (tris 2, 4-dichlorophenoxy ethyl phosphite) 1, 2 and 3 gal/A. These materials were applied at the 6 in, 12 in and 24 in stages of growth. All treatments were replicated three times.

Dalapon applications at all rates and combinations resulted in satisfactory control of Johnsongrass. Applications made at the six and twelve inch stages were more effective than later applications. Split treatment of 10 lb each were more effective than a single 20 lb application. The addition of amino triazole or maleic hydrazide did not appear to increase the effectiveness of dalapon. Erbon applied at 1 pt/sq rd gave excellent control while rates of $\frac{1}{2}$ and $\frac{1}{4}$ pt were insufficient. Sodium 2,2,3-trichloropropionate at 20 lbs/A applied at 6 in and 12 in stages resulted in satisfactory control. Other herbicides included in the study were not effective at the rates used.

Plots treated with dalapon and erbon in May, 1955 were observed during the 1956 growing season. Oats, corn, and forage sorghum were successfully grown in plots treated with dalapon at 40 lbs/A or erbon at 2 pts/sq rd. No injury to these crops from soil residues was evident in these observations. Johnsongrass seedlings that appeared were controlled by hand hoeing. (Contribution of the Kansas Agricultural Experiment Station.)

Spot treatment of Johnsongrass with dalapon. Fletchall, O. Hale. Johnsongrass in a hybrid seed corn production field was sprayed twice, June 20 and July 19, to moisten the foliage with 20 lb ahg dalapon using hand sprayers. It was not possible to keep the dalapon entirely off the corn and some injury, in the form of short husks and poorly filled cobs, was noted. The corn yields showed that benefit from Johnsongrass control exceeded the damage from dalapon. The check yielded 49 bu/A and the treated plots averaged 69 bu/A. Johnsongrass control as

determined by count of culms at harvest time (August 31, 1956) was 90%. The treatment greatly reduced the vigor of the Johnsongrass plants. (Contribution of the Missouri Agricultural Experiment Station.)

Effect of dalapon in repeated light foliage treatments for controlling Johnsongrass at different seasons. Freeman, J. F. Plots 7 x 9 ft in size were laid out on a heavy 3rd year stand of Johnsongrass in a randomized block design with 3 replications. Treatments were dalapon at 9, 18 and 27 lb/A total rates, each applied to early growth foliage, that of regrowth after 1st cutting at boot stage, and that of regrowth after 2nd cutting at boot stage; and no treatment. One-third of the dalapon shown for each rate was used in water, 170 gal/A, repeated at each of 3 applications approximately 1 week apart, the series on early growth Johnsongrass being started 6/6/56, that on 1st regrowth 7/17/56, and that on 2nd regrowth 9/4/56. Plants were 9 to 15 inches high when each series of treatments was begun. The number of plant stems/25 sq ft nearest center of plots to avoid border effects was determined 9/9/56 for treatments applied on early growth foliage, and on 1st regrowth foliage. Data for 2nd regrowth treatments are not yet available. Results: Based on untreated check plots which had an average 22 plant stems/sq ft, dalapon applied on 1st growth Johnsongrass resulted in 75% control for the 9 lb rate; 80% control for the 18 lb rate; and 90% control for the 27 lb rate. On 1st regrowth foliage, better than 97% control resulted from either rate, although in no case was kill complete. (Contribution of Agronomy Department, Kentucky Agricultural Experiment Station.)

Johnsongrass control with herbicides used on the soil. Freeman, J. F. Plots 7 x 9 ft in size were laid out in November 1955 on a dense 2nd year stand of Johnsongrass to compare several herbicides each at 3 rates and at 3 seasons of application. The soil is a highly productive Burgin silty clay loam with tile under-drainage. The design of the experiment was split-plot with 3 replications, the whole plot for the herbicide and sub-plots for rates and seasons of treatment. Herbicidal formulation rates and seasons of use were: sodium chlorate at 3/4, 1 and 1 1/2 lb/100 sq ft; 90% sodium TCA at 3, 4 and 6 oz/100 sq ft; CMU, 80% at 22, 44 and 88 lb/A; Ureabor at 3/4, 1 and 2 lb/100 sq ft; Chlorax at 1 1/2, 2 1/4, and 3 lb/100 sq ft; Baron at 1/6, 1/3, and 1/2 pt/100 sq ft; DB Granular at 3/4, 1 and 2 lb/100 sq ft; each in late fall (11/10/55), in early summer (6/1/56), and in late summer (8/15/56); and untreated check. Before and during the test Johnsongrass was mowed and removed as the plants approached bloom stage to prevent seed production. Herbicides were applied on the soil and stubble after removal of plants -- the sodium chlorate, Ureabor, Chlorax and DB Granular being applied broadcast in sand mixture, and the sodium TCA, CMU and Baron being applied in water spray 1/2 gal/plot. The number of plant stems per 25 sq ft in each plot were determined for late fall and early summer treatments. Results of the late summer treatments are not yet available. Results: In general the fall treatments were less effective than were early summer treatments. None of the herbicides applied in the fall at rates used were entirely effective, but sodium chlorate and Chlorax at heaviest rates were most nearly so. Sodium chlorate at 1 1/2 lb/100 sq ft; sodium TCA at 6 oz/100 sq ft; CMU at 88 lb/A; Ureabor at 2 lb/100 sq ft in early summer destroyed all Johnsongrass. Chlorax at 3 lb/100 sq ft, sodium chlorate at 1 lb/100 sq ft, and CMU at 44 lb/A killed 99% or more of the plants. Medium rates of Baron and DB Granular at either season reduced the number of plant stems to about 50% of those on the untreated check. The higher rates gave slightly better control and the light rates somewhat poorer. (Contribution of Agronomy Department, Kentucky Agricultural Experiment Station.)

Some cultural and chemical methods in Johnsongrass control. Rogers, B. J., and Hart, R. D. In June, 1955, a series of 1/20-acre plots (on a Genessee silt loam soil near Terre Haute, Ind.) were treated with 10, 20, and 30 lbs/A of 2,2-dichloropropionic acid, sodium salt (dalapon); 40 and 80 lbs/A of TCA, sodium salt; 4, 8 and 12 lbs/A of amino triazole; 8 and 16 lbs/A of MH; and 10, 20, and 30 lbs/A of 2,2,3-trichloropropionic acid, sodium salt. At the time of application the Johnsongrass (Sorghum halepense) was 2-3 feet in height. One-half of the area was divided into 3 strips crossing the plots perpendicularly, and these strips were plowed 2, 3, and 4 weeks after treatment. The other half was plowed, disced, and planted to corn and soybeans. Roadways between the strips were kept free of vegetation by discing throughout the summer. In Oct., 1955, an untreated section of the field was disced twice and 60, 85, and 105 lbs/A of nitrogen applied as anhydrous ammonia. In May, 1956, the entire field was planted to corn. A check on the Johnsongrass present in Sept., 1956, indicated these results: (1) the control brought about by the 20 and 30 lb treatments of dalapon and the 40 and 80 lb treatments of TCA in 1955 was still evident in 1956 (70-80% reduction in Johnsongrass, no injury to corn); (2) plowing after application in 1955 showed little or no effect in 1956; (3) the roadways kept disced in 1955 showed a 70-90% reduction in Johnsongrass population over untreated checks; and (4) the anhydrous ammonia treatment showed no evident control of Johnsongrass. Pre-emergence treatments for seedling control were made May 21, 1956. No apparent control resulted from application of 1 and 2 lbs/A of CMU; 4 lbs/A of alpha-chloro-N,N-diallyacetamide; 4 lbs/A of polychlorobenzoic acids; and 12 lbs/A of 2-chloro-4,6-bis(diethylamino)-s-triazine (Geigy 444). (Contribution of the Dept. of Bot. and Plant Path., Purdue Univ. Agricultural Expt. Sta., Lafayette, Indiana.)

Control of Johnsongrass with cultivation and chemicals. Wiese, A. F. and Rea, H. E. Cultural and chemical practices for the control of Johnsongrass in a heavily infested road ditch were started in the fall of 1954 and continued until winter wheat was planted in September 1955. Cultivations were made with a 30-inch sweep plow. Johnsongrass control was determined 2 months after wheat harvest in 1956. The plot size was 1 by 2 rods, and the experimental design was a randomized block with 2 replications. One fall cultivation followed by 3-week cultivation periods in 1955 and 2-week, 3-week or 4-week cultivation periods in 1955 gave 99.5 percent or more control. Fifty pounds per acre of TCA (sodium salt) or 320 pounds per acre of sodium chlorate applied in the fall of 1954 and 15 pounds per acre of dalapon applied in the spring of 1955 followed by 3-week cultivations in 1955 gave equally effective control. Similar applications of the 3 chemicals followed by 2 cultivations in 1955 eliminated only 50 percent of the Johnsongrass. None of the treatments significantly increased the wheat yields over that of the check, 16.5 bushels per acre, but yields were reduced to 4.5 and 3.6 bushels per acre by the two sodium chlorate treatments. (Contribution of the Amarillo Experiment Station, Bushland, Texas, USDA and Texas Agricultural Experiment Station cooperating.)

QUACKGRASS

Summary

E. A. Helgeson

Experimental results reported this year are as usual variable and tend to illustrate the effects of variations in technique and environment. Also, too few experiments were available to permit the establishment of any but the most general conclusions.

Dalapon (sodium 2,2-dichloropropionate) was used in a number of instances as a temporary control measure, or as an eradicant. Seasonal control was obtained at rates from 4 to 10 lb/A and eradication from 20 to 60 lb/A. Tillage a week or so after application gave variable results. Residual effects were dissipated in about 24 days after spring applications of moderate amounts, but fall treatments were made toxic the next spring even at a 5 lb/A rate.

Several chlorinated benzoic acids applied at rates of from 2 to 4 lb.A gave excellent seasonal control and permitted the production of a corn crop. The residual effect of these acids seems to be of longer duration than dalapon and it maybe modified by tillage.

As in the past CMU at 20 to 40 lb/A has given control when applied to undisturbed sod. Tillage frequently reduced its effectiveness.

Reported as more or less effective in one or two trials were ATA, PDU, ammate MH, ureabor and chlorea.

Abstracts

Effect of herbicides on couch grass. Brown, D. A. TCA at 25, 50, 75 and 100 lb/A. CMU and dalapon at 20, 40, 60 and 80 lb/A; ureabor and chlorea at 250 and 450 lb/A and DB granular (dry) powder (in water) at 800 and 1200 lb/A, were applied to dense stands of couch grass in June and late September each year 1953 to 1955. No tillage was given. Results: CMU plots at the end of 1956 at all rates remain free of couch grass. At the 60 and 80 lb/A rates vegetation of any kind is absent even at the end of three years. Dalapon plots at 20 lb/A showed a 30 percent stand of grass the year after treatment. At the two higher rates dalapon has killed the grass completely but at the end of three years vegetation covers the plots consisting mainly of annual grasses, alfalfa, Russian and perennial sow thistle. Ureabor at the rates used has compared favorably with CMU while Chlorea has given results similar to dalapon. DB in both forms at the rates used has not satisfactorily killed couch grass. TCA at 25 lb/A applied in June to thin stands of couch grass on land being summerfallowed, and, therefore accompanied by tillage, has given 90 percent control compared with 65 percent on untreated plots. Satisfactory grain crops have been grown the following year. (Contributions from Experimental Farm, Brandon, Man.)

Value of chlorinated benzoic acids and other herbicides in controlling quackgrass. Buchholtz, K. P. Chlorinated benzoic acids predominating in the following isomers were applied to plots 15 by 20 feet in an old quackgrass sod; 2,3,6-trichlorobenzoic acid (2,3,6-TBA) as the sodium salt (Heyden 1281), 2,3,5-trichlorobenzoic acid (2,3,5-TBA) as an amine salt (Hooker X80), 2,3,5,6-tetrachlorobenzoic acid (2,3,5,6-TBA) as an amine salt (Hooker X33) and as an acid emulsion (ACP M-103). In addition MH, dalapon and amino triazole (AT) were applied alone and mixtures of 2,3,6-TBA and AT, mixtures of 2,3,6-TBA and dalapon and a mixture of MH and 2,3,6-TBA were included. Applications were made on May 14 when the quackgrass was about 8 inches tall using 20 gal/A of spray. The

area was plowed on May 21 and planted to W464 corn on May 23. When the corn was in the 3-leaf stage 1.5 lb/A of diuron and 0.5 lb/A of 2,4-D were applied to control annual weeds. No tillage was given during the year after planting. Counts of quackgrass shoots were obtained on June 18. Corn injury percentages were taken on July 5. At maturity yields of corn were obtained.

Material	lb/A	Quackgrass shoots/sq. ft.	Corn plants injured-pct.	Corn yield bu/A
MH	4	0.6	1.7	81.7
2,3,6-TBA	8	1.1	56.7	28.8**
2,3,6-TBA + MH	2 + 2	3.0	5.4	73.5
2,3,6-TBA	4	3.0	4.7	60.5**
2,3,5,6-TBA acid	4	3.3	1.7	73.7
2,3,6-TBA + AT	4 + 1	3.6	36.8	62.8**
2,3,6-TBA + dalapon	2 + 4	4.1	66.8	46.1**
2,3,5-TBA	4	4.6	2.6	75.9
2,3,6-TBA	2	4.7	4.7	70.3
2,3,6-TBA + dalapon	2 + 2	5.3*	33.9	65.5**
2,3,5,6-TBA amine	4	5.4*	3.8	77.5
Dalapon	4	9.1**	33.7	65.5**
2,3,6-TBA + AT	2 + 1	9.1**	8.4	69.9*
AT	4	15.8**	1.1	64.4**
Check	----	40.8**	0.5	40.4**
LSD 5 pct. level		4.1	- -	11.7
LSD 1 pct. level		5.5	- -	15.6

An analysis of the data showed that all treatments reduced shoot counts significantly below that on check plots. Plots treated with MH had the fewest shoots but the numbers did not differ significantly from that obtained with the various benzoic acid preparations or with several of the mixtures. Highest yields of corn were obtained on plots treated with MH but yields from plots treated with 2,3,5-TBA, 2,3,5,6-TBA at, 4 lb/A or with 2,3,6-TBA at 2 lb/A were not significantly less. Reduced yields of corn were closely associated with excessive corn plant injury. 2,3,6-TBA at 4 lb/A resulted in noticeable injury to the corn and at 8 lb/A severe injury occurred. Dalapon at 4 lb/A also gave considerable injury and reduced corn yields somewhat. (Dept. of Agronomy, Univ. of Wisconsin, Madison).

The effect of ATA and MH alone and combined with tillage on couchgrass. Carder, A. C. In early June of 1955 ATA and MH were applied at several different rates to a couchgrass stand 8 to 10 in. tall. The chemicals were applied in a water spray at the rate of 80 gal/A. The experiment was examined one year later and the various treatments appraised. Procedure and results are described in the table.

Treatment	Rate lb/A active ingredient	Percentage survival* one year from time chemical applied ATA	MH
Chemical applied to undisturbed sod	4	84#	62
	8	73	35
	12	18	25
	16	14	16
Chem. applied, one-wayed 5 in. deep one week later	4	67	96
	8	82	56
	12	21	25
	16	19	12
Chem. Applied, one-wayed 5 in. deep two weeks later	4	23	53
	8	47	28
	12	12	22
	16	9	18
Chem. applied, one-wayed 5 in. deep three weeks later	4	18	81
	8	42	79
	12	12	33
	16	10	17

*Arbitrary units by same appraiser.
Av. duplicate plots.

The data indicate that under the conditions of this experiment ATA gave generally better kills than MH when used at the same rates and in the same manner. Cultivation appeared to increase the effectiveness of ATA but not that of MH. No treatment gave complete kill, but ATA applied at 16 lb.A followed by tillage 2 to 3 weeks later gave approximately 90% eradication. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

Couchgrass control with dalapon combined with tillage. Carder, A. C. The experiment consisted of two parts. In the first, dalapon was applied in 1954 when the couchgrass was one foot high, the sod was thoroughly one-wayed one month later, then two weeks following this again one-wayed with a light one-waying given early in the fall. In the second, the procedure was reversed, i.e., a thorough one-waying was done in the late spring followed by a second one-waying one month later with dalapon applied six weeks after the initial tillage. Like the first part of the experiment, a light one-waying was given in early autumn. The chemical was applied at nil, 10, 20, 40 and 60 lb/A active ingredient in a water spray at the rate of 40 gal/A. The effects of the different treatments on the couch were appraised one and two years after. Results are shown in the table.

Dalapon lb/A	Percentage survival and recovery* after years following treatment			
	1 yr.	2 yr.	1 yr.	2 yr.
	Dalapon applied before cult.		Dalapon applied after cult.	
Nil	18.3#	33.3	28.7	37.3
10	10.8	21.7	6.7	16.7
20	7.8	20.0	4.3	6.7
40	3.8	8.3	1.5	3.3
60	6.3	17.3	0.5	1.0

*Arbitrary units by same appraiser.
Av. triplicate plots.

The data indicate that even 60 lb/A of dalapon did not completely eradicate the couchgrass. Somewhat better kills were obtained where the chemical was applied after tillage than before. The unusually slow recovery of the couch even on those plots where no chemical was applied is apparent. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

The effect of ammonium sulphamate (Ammate) alone and combined with tillage on couchgrass. Carder, A. C. In mid-May, 1955, Ammate was applied at nil, 1, 2, 4 and 6 lb/sq. rod to a solid stand of couchgrass. The chemical was applied in an aqueous solution at the rate of 80 gal/A. In one series the couch sod was left undisturbed; in a second, third and fourth series it was thoroughly one-wayed one, two and three weeks respectively, after application of the herbicide. The effects of the various treatments were appraised from time to time. Results are shown in the table.

Treatment	Ammate lb/sq. rod	Percentage survival and recovery* after treatment	
		4 mo.	1 yr.
Ammate applied to undisturbed sod	Nil	100#	100
	1	100	98
	2	65	72
	4	12	11
	6	8	5
Ammate applied, one-wayed 5 in. deep 1 week later	Nil	78	100
	1	20	24
	2	11	8
	4	6	3
	6	5	0
Ammate applied, one-wayed 5 in. deep 2 weeks later	Nil	78	20
	1	32	22
	2	7	5
	4	4	2
	6	2	1
Ammate applied, one-wayed 5 in. deep 3 weeks later	Nil	70	80
	1	22	10
	2	1	0.5
	4	2	0
	6	0	0

*Arbitrary units by same appraiser.
Av. duplicate plots.

The data indicate that cultivation enhanced the effect of Ammata, particularly if delayed till 3 weeks after the chemical was applied. With tillage at this time 4 lb/sq. rod effected eradication of the couchgrass in one year, while 2 lb/sq. rod almost achieved this result. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

The use of dalapon to control couch and bromegrass around trees and shrubs. Carder, A. C. A solution consisting of one oz. dalapon to one gal. water was applied to the foliage of couch and bromegrass growing under and close to the boles of various species of trees and shrubs. The solution was knapsack sprayed until the grass foliage was thoroughly wet. It is believed that this rate of application corresponded to 5-10 lb dalapon per acre. The first application of the herbicide was made on May 30 when the growth of the grasses was about 8 in. high. Care was taken not to wet any of the foliage of the woody species with the solution, although with small specimens this was not always possible. Retreatment with dalapon at the same rate was made on July 11. Woody species tested were common lilac, larch, apple, oak, saskatoon, rose, caragana, popular, currant, birdcherry, aspen and virginia creeper. Examination on September 15 showed that excellent top growth kill of the grasses had been obtained, while the foliage of the woody species was largely uninjured, except that of birdcherry, oak and larch. These latter species were represented by samll specimens and it is thought that their foliage caught considerable of the herbicide. Final results will not be known until 1957. (Contribution of Experimental Farm, Beaverlodge, Alberta).

The comparative effect of PDU and CMU when applied to undisturbed couchgrass sod. Carder, A. C. PDU (fenuron) was applied at 20, 40, 80 and 100 lb/A active and CMU (monuron) at 40 lb/A active ingredient for comparison to undisturbed couchgrass sod in the spring of 1953. The chemicals were applied in a water spray at the rate of 80 gal/A. The couch was a foot high and in shot-blade. Soil moisture was good in 1953 through to 1954, somewhat scant in 1955 but fair in 1956. The effects of the various treatments were appraised from time to time. Results are shown in the table.

lb/A	Percentage survival and recovery* after months or years following treatment					
	2 mo.	4 mo.	1 yr.	15 mo.	2 yr.	3 yr.
PDU at 20	43.8#	35.0	27.5	61.2	82.5	97.5
40	21.2	10.0	7.2	11.0	10.5	23.0
80	12.5	2.2	2.5	1.2	0.5	0.0
100	7.5	1.0	1.2	0.5	0.0	0.0
CMU at 40	21.2	10.0	6.0	10.5	9.2	12.0

*Arbitrary units by same appraiser
Av. quadruplicate plots.

The data indicate that under the conditions of this experiment 80 lb/A of PDU or more were required to eradicate couchgrass. At 40 lb/A of this chemical, elimination was approached one year after treatment but recovery set in after that time. With 20 lb/A only a partial kill was obtained and recovery was rapid in the second year. The data show the slow but progressive action of PDU when applied at lethal amounts. Also indicated is the fact that CMU at 40 lb/A had a more potent effect than PDU at the same rate. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

Treatment of couchgrass with CMU alone and combined with tillage. Carder, A. C. A continuous infestation of couchgrass on a shallow black clay loam was treated in late spring and early fall of 1952 with CMU (monuron) at 4 rates. The treatments were combined with 4 tillage practices. The chemical was applied in a water spray at the rate of 80 gal/A. Procedure and results are described in the table.

Treatment	CMU lb/A	Percentage survival and re-establishment* after years following treatment							
		Spring treatment				Fall treatment			
		1 yr.	2 yr.	3 yr.	4 yr.	1 yr.	2 yr.	3 yr.	4 yr.
CMU on undisturbed sod	10	15#	8	12	8	12	5	7	11
	20	5	0	0	2	4	2	0	2
	40	1	0	0	0	2	0	0	0
	80	0	0	0	0	0	0	0	0
CMU applied, one-wayed once 5 in, deep two weeks later	10	18	40	48	62	65	32	38	42
	20	10	6	6	8	18	14	10	8
	40	5	0	0	0	12	6	5	5
	80	1	0	0	0	4	0	0	0
One-wayed once 5 in. deep, CMU applied	10	28	48	35	82	40	48	55	75
	20	15	5	2	2	32	15	7	10
	40	8	1	0	0	15	1	0	0
	80	2	0	0	0	12	0	0	0
One-wayed once 5 in. deep, CMU applied, one-wayed again immediately	10	15	25	20	32	40	35	38	48
	20	12	8	5	6	28	22	25	25
	40	5	0	0	0	25	14	11	15
	80	1	0	0	0	16	8	6	8

*Arbitrary units by same appraiser.
Av. duplicate plots.

The data indicate that under the conditions of this experiment CMU was best applied on undisturbed sod. Applied in this way, as little as 20 lb/A active CMU eradicated the couch, but when tillage was involved a complete kill was never obtained. Wherever 40 lb/A or more were applied in the spring with or without cultivation freedom from the weed was obtained up to 4 years. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

The comparative effect of dalapon and ATA on couchgrass. Carder, A. C. The initial application of the chemicals was made mid-June when the couchgrass was 8-10 in. high, re-treatments when resprouts were 4-6 in. high. The herbicides were applied by hand-boom sprayer using an aqueous solution at 60 gal/A. The effects of the various treatments were appraised mid-September. Procedure and results are described in the table.

Tillage treatment	Chemical treatment	Chemical lb/A active ingredient	Percentage top-growth survival
One-wayed 5 in. deep two weeks after chemical applied.	One treatment applied in spring.	4 ATA	97
		8 ATA	67
		12 ATA	49
		4 DAL	36
		8 DAL	21
		12 DAL	20
		4 ATA + 4 DAL	36
	Spring treatment followed by retreatment at half rates	4 ATA // 2 ATA	58
		8 ATA // 4 ATA	46
		12 ATA // 6 ATA	44
		4 DAL // 2 DAL	31
		8 DAL // 4 DAL	14
		12 DAL // 6 DAL	6
		4 ATA + 4 DAL // 2 ATA + 2 DAL	43
		4 ATA // 2 DAL	87
One-wayed 5 in. deep 4 weeks after chemical applied.	One treatment applied in spring	4 ATA	100
		8 ATA	92
		12 ATA	94
		4 DAL	66
		8 DAL	20
		12 DAL	10
		4 ATA + 4 DAL	62
	Spring treatment followed by retreatment at half rates	4 ATA // 2 ATA	71
		8 ATA // 4 ATA	44
		12 ATA // 6 ATA	44
		4 DAL // 2 DAL	38
		8 DAL // 4 DAL	16
		12 DAL // 6 DAL	14
		4 ATA + 4 DAL // 2 ATA + 2 DAL	40
		4 ATA // 2 DAL	88

The date indicate that under the conditions of this Experiment: 1) dalapon was almost thrice as effective in suppressing top-growth of couch as ATA, 2) the addition of ATA to dalapon did not enhance the effectiveness of the latter, 3) with both chemicals, retreatment at halved rates generally gave a considerably increased effect, and 4) tillage 2 weeks after the chemicals were applied was generally more effective than that given 4 weeks after. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

The effect of tillage on the persistance of dalapon and 2,3,6-trichlorobenzoic acid when used to control quackgrass. Johnson, B. G. and Buchholtz, K. P. Plots 15 x 25 feet in size were established in an old quackgrass sod. On April 9, 1956, the area was fertilized with 500 lb/A of commercial 10-10-10 fertilizer. On May 15 when the grass was 8-12 inches tall plots were treated with the sodium salt of 2,2-dichloropropionic acid (DPA) at 4, 8 and 16 lb/A,

and the sodium salt of 2,3,6-trichlorobenzoic acid (TBA) at 4 and 8 lb/A. Two treatments were made at each rate and the plots arranged so that on May 22 half of them were plowed and the other half plowed and disced. On May 23 and 31, and on June 6 two rows of W464A corn were planted across all plots, the interval after treatment being 8, 16 and 24 days respectively. On June 5, 1-1/2 lb/A of diuron and 1/2 lb/A 2,4-D were applied to control the growth of annual weeds. The area was not cultivated during the season. On June 18 shoot counts were taken and at maturity the corn harvested and yields of grain calculated.

Tillage	Appl. lb/A	Shoot counts pct. check	Corn yields at planting intervals - bu/A 8 days	16 days	24 days
Plow	DPA - 4	17.9**	55.2	58.0**	46.5**
	8	8.8	16.3**	41.5*	50.6**
	16	7.0	0.8**	21.2	57.9**
	TBA - 4	5.8	51.8	45.4**	48.9**
	8	2.3	15.2**	21.5	29.7**
	None	105 shoots per sq. ft.	47.8	20.9	9.2
Plow + Disc	DPA - 4	35.4**	38.9	47.9**	44.8**
	8	19.0**	17.0*	43.4*	53.8**
	16	14.1**	17.0*	40.8*	53.1**
	TBA - 4	14.6**	38.7	51.5**	50.7**
	8	4.9	24.7	25.5	26.3
	None	69 shoots per sq. ft.	47.6	26.1	17.1

Results of the two tillage treatments were compared. Shoot counts on all treated plots were significantly less than checks for both tillage treatments. Shoot counts on plow + disc checks were less than on plowed checks. However, comparing each treatment with 8 lb/A of TBA which gave the best shoot control, all of the plow + disc treatments showed significantly less control, while of the plowed treatments only 4 lb/A of DPA showed significantly less control. This appears to indicate that discing in addition to plowing reduced the effectiveness of the chemicals, either by more thorough mixing of the chemical with the soil, aiding decomposition, or by stimulating the quackgrass by cutting the rhizomes into smaller sections.

Yields of corn from check plots showed a steady decline in yield due to quackgrass competition. Corn planted 8 days after treatment on plots receiving the higher rates of DPA and TBA showed less reduction in yield when plowed and disced than when plowed, as compared to checks. Decreases in yield due to increased rates of DPA for corn planted 8 and 16 days after treatment was less when plowed and disced. After 24 days DPA is considered no longer toxic to corn and the increased yield with increased rate was due to greater quackgrass control. TBA persists for much longer periods in the soil and thus plowing and discing of high rate plots did not reduce its effectiveness significantly within 24 days. (Department of Agronomy, University of Wisconsin, Madison.)

Control of quackgrass with dalapon. Yeo, R. R., Dunham, R. S. and Herrett, R. T. Fall applications of dalapon at 5, 10, 15 and 20 lb/A were made to undisturbed quackgrass in October, 1955 and spring applications of 5, 7 1/2 and 10 lb/A were made in May, 1956 to quackgrass 4-6 in. tall. One-half

of each plot was disked in the spring 4 days after application of dalapon and the other half 28 days following application. The soil was Bearden clay loam. Results: Complete eradication resulted from the 20 lb/A rate. Complete control was effected by the 15 lb/A rate until July when abundant regrowth occurred. Lower rates were less satisfactory. Temporary control for 6-8 weeks followed spring applications; 60%, 90% and 95% from 5, 7 1/2 and 10 lb/A, respectively. Late disking delayed regrowth but had no effect on ultimate control. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn., Paper No. 3666, Sci. Jour. Series, Minn. Agric. Exp. Sta.)

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Annual and Winter Annual Grass Weeds

R. S. Dunham

Summary

Wild oats continues to be of major interest among the annual grass weeds. Of 34 abstracts submitted, 27 reported studies on the control of wild oats. Chemical methods were used in 21 trials, cultural methods in six experiments. All but one report came from Canada.

CDAA was generally effective. Some fall applications with rates up to 10 lb /A did not prove satisfactory but spring treatments reduced stands from 50 to almost 100%. Some injury to crops sown soon after application of the chemical was reported but it did not always occur. Among wheat, oats, barley, and flax, wheat was most sensitive and flax and barley the most tolerant. In Minnesota trials, neither the oil content of flaxseed harvested from treated plots nor the iodine number of the oil was depressed.

In most of the Canadian trials, the CDAA was mixed with the soil by disking or rototilling. In Minnesota the herbicide was applied in the conventional pre-emergence manner. Two abstracts refer to a comparison of these methods of application. Ebell, Vanden Born, and Corns state that CDAA applied in the spring at 10 lb/A, gave good control when the plots were (1) sprayed and then rototilled and (2) rototilled, sprayed, and rototilled. There was no control from two other treatments with which they were compared: (1) rototilled and sprayed and (2) sprayed only. H. A. Friesen writes "Incorporation of the chemicals with the one-way disc very materially influenced their effectiveness, whether the spraying was done in the fall or in the spring. Indeed, with only a few exceptions, where the herbicides were not incorporated into the soil they were largely ineffective". The chemicals referred to were IPC, CIPC, CDAA, CDEA, CDEC, trichloro and polychlorobenzoic acid, isopropyl and sec-butyl N-(3-methyl phenyl) carbamate, MCP butyl ester, 2,4-D butyl ester, and 4-(2,4-DB). Results reported in 1955 indicated that incorporation of CDAA with the soil (1) was preferable under dry conditions, and (2) that crops were more seriously injured by this method.

Several trials with IPC or CIPC were reported from Canada. Results with fall applications varied from almost complete control with 10 lb/A to only 50% reduction of stand with 10 lb or to 92% reduction with 15 lb or 60% with 45 lb. Small grains and flax sown early the next spring were injured, sometimes killed. Spring applications were effective in some trials but seriously injured or killed flax and small grains unless sowing was delayed. When barley was sown late, however, the control of wild oats was equally good without any chemical treatment as with it.

2,4-D applied at heavy rates (15-25 lb/A) in the fall reduced the stand of wild oats from 60 to over 90% but injured spring sown flax and sometimes small grains.

Cultural methods compared for the control of wild oats included: (1) burning the stubble (2) using the rod weeder (3) increasing the rate of sowing and (4) applying fertilizer. Burning in the fall was effective but not in the spring. Cultivating with a rod weeder when early sown barley was emerging reduced wild oats about 50%. Sowing barley at 2½ bu/A reduced the number of wild oats in the threshed grain. Fertilizing the plots further reduced the number. Delayed sowing, however, was the most effective of all methods tried.

In trials to control green foxtail, TCA and dalapon used post emergence in flax were generally the most successful of the chemicals tried. Delayed sowing of crops was more effective than other methods of cultural control.

Abstracts

CDAA (randox) and CDEC for control of wild oats. Brown, D. A. Randox and CDEC were applied at 4 and 8 lb/A in two volumes of water; 6 and 12 gal/A to land heavily infested with wild oats seed May 21, 1956. The chemical was thoroughly disked into the soil and the next day wheat, oats, barley and flax were seeded at right angles to the treated strips. An untreated strip as a check alternated with each treated strip. A further check was provided by leaving regular sets of treated and untreated plots uncropped. The stand of wild oats culms on untreated, uncropped plots was taken at 100%. Readings on all other plots were scaled from this base. Estimates were made from replicated square yard counts. Results: Treated plots left uncropped averaged 13% stand of wild oats. Formulations gave no significant difference, neither did volume of water. Averaging all plots, randox reduced the stand of wild oats to 10% compared with 11 for CDEC. The 8 lb/A rate reduced the stand of wild oats to 8% compared with 18% for the 4 lb/A rate. The average stand of wild oats on all plots treated and seeded to grain was 8% compared with 61% in grain plots not treated. Stands of wild oats in the various classes of grain on treated plots in % were: barley 5, wheat and oats 8, flax 12. In untreated grain: barley 46, wheat 55, oats 62, and flax 80. Grain stands were reduced on treated plots, wheat to 48%, oats 53, barley 77 and flax 78. Severe lodging of crop rendered yield comparisons worthless. (Contribution from Experimental Farm, Brandon, Man.).

IPC as a soil treatment for control of wild oats. Brown, D. A. Wheat stubble heavily infested with wild oats was treated on October 26, 1955 with IPC at 5, 10, or 15 lb/A applied in a water spray. Immediately after application it was incorporated into the surface 3 to 4 inches of soil by tandem disc. Plots were harrowed early in the spring of 1956 and half of each plot seeded to barley. One month later the other half of each plot was cultivated and harrowed to kill all weed growth and barley seeded. Results: IPC successfully controlled wild oats at all three rates. Barley sown May 9, however, was a failure. Sown June 10, barley yielded from 32.5 to 37.7 bu/A. Late sowing without chemical treatment resulted in about 53% control of wild oats but the barley yielded about 10 bu less. The absence of wild oats hardly accounts for the highly significant difference. There was suggestion of some stimulus from the chemical. Wild millet completely covered these plots but practically no wild oats appeared. (Experimental Farm, Brandon, Man.).

Cultural control of wild oats. Brown, D. A. Experiment A. Barley was seeded May 10 and June 10, on fall ploughed stubble land. Half of the plots seeded on each date were tilled with the rod weeder just as barley was emerging. The other plots received no post-seeding tillage. All plots were cultivated shallow and harrowed before seeding. Experiment B was conducducted on the same design as A with the same date pattern of seeding but tested the influence of rates of seeding and chemical fertilizer on wild oats infestation. All plots were lightly cultivated and harrowed before seeding and harrowed after seeding. Barley had been grown 3 successive years in both experiments under the same treatment in each case. Representative samples of mature wild oats consisting of 100 panicles each were harvested from 10 replicates. Weight per panicle figuring 34 lb/bu was used for yield. (Contribution from Experimental Farm, Brandon, Man.).

Date seeded and treatment	Wild Oats culms per sq.yd	Yields - bu/A Barley clean	Wild Oats in threshed grain	Wild Oats estimated total
Experiment A.				
May 10, post seeding tillage	197	23.9	2.9	14.7
May 10, no " "	185	22.8	5.1	24.2
June 10, post seeding tillage	1.5	45.0	.0	.11
June 10, no " "	1.9	36.9	.02	.27
Experiment B.				
May 10, 1¼ bu/A no fert.	166	29.9	3.6	24.5
May 10, 1¼ bu/A 60 lb 16-20-0/A	174	29.6	3.8	26.8
May 10, 2½ bu/A no fert.	95	29.5	2.3	14.2
May 10, 2½ bu/A 60 lb 16-20-0/A	58	36.3	1.4	9.3
June 10, 1¼ bu/A no fert.	.3	38.3	.0	.05
June 10, 1¼ bu/A 60 lb 16-20-0/A	.7	45.1	.0	.11
June 10, 2½ bu/A no fert.	.4	38.5	.0	.06
June 10, 2½ bu/A 60 lb 16-20-0/A	.4	43.5	.0	.06

Cultural control of green foxtail (Setaria viridis). Brown, D. A. This experiment began in 1955 with wheat on summerfallow. The exact experiment was continued in 1956 on the same plots. Wheat stubble was ploughed in October 1955 and shallow tilled and harrowed preceding both dates of seeding in 1956. Treatments included A- wheat sown May 10; (1) rod weeder used pre-emergence (2) harrowed pre-emergence (3) harrowed post emergence (4) rod weeder used pre-emergence plus harrow used post emergence (5) no treatment and B- wheat sown June 10; (1) rod weeder pre-emergence plus harrow post emergence (2) no post sowing tillage. Results: Early seeded plots were heavily infested with green foxtail while plots seeded June 10 were comparatively free. Using the rod weeder pre-emergence, harrowing post emergence or combining the pre-emergence use of the rod weeder and the harrow resulted in about 60% control of the foxtail. Best control and highest yields of wheat resulted from delayed sowing. Yields were as follows: Treatments A (1) 14.1 bu/A (2) 16.0 (3) 13.6 (4) 15.9 (5) 13.6 B (1) 17.6 (2) 17.8. (Contribution from Experimental Farm, Brandon, Man.).

Selective control of wild oats in flax. Canvin, D. T. and Friesen, George. On May 15, 1956, three herbicides, each at two rates (IPC and CDAA at 3 and 6 lb/A, 3,4-D at 5 and 10 lb/A), were applied to a heavy clay loam soil infested with wild oats. All herbicides were applied in 10 gal water/A and incorporated into the top 2 - 3 inches of soil by means of a rototiller. Raja flax was sown at 4 dates after treatment: (Date I - one week, Date II - 2 weeks, Date III - 3 weeks, Date IV - 4 weeks). The effect of the herbicide on wild oats and flax yields are presented in the following table:

Treatment	Wild oat plants per sq yd	Yield of Flax in Bu/A Date I	Date II	Date III	Date IV
Clean check	0	17.9	16.7	12.5	16.4
Weedy check	12.2	6.8	6.4	5.4	1.5
CDAA 3 lb/A	2.2	12.1	13.4	16.0	14.5
CDAA 6 lb/A	1.1	16.9	17.3	18.6	18.2
IPC 3 lb/A	.3	XX	XX	12.9	17.6
IPC 6 lb/A	0	XX	XX	XX	11.9
3,4-D 5 lb/A	9.7	XX	XX	XX	XX
3,4-D 10 lb/A	2.0	XX	XX	XX	XX

XX = Flax killed

Both CDAA and IPC were very effective in controlling wild oats. Flax was undamaged in the CDAA plots even when seeded immediately after treatment. In the IPC plots flax was killed unless seeding was delayed from three to four weeks. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg.)

<u>The selective control of wild oats in grain crops by the use of CDAA and CDEC.</u> Carder, A. C. On May 18, 1956, CDAA and CDEC were applied by hand-boom sprayer at 4 and 8 lb/A active ingredient to land fitted for seeding and heavily contaminated with a natural infestation of wild oats. The chemicals were used in aqueous solution at 10 and 20 gal/A. After application the area was immediately double disced and seeded to Saunders wheat, Beaver oats, Redwing glax and Chancellor peas. Heavy rains shortly following induced good germination of the seeded crops and wild oats. Three weeks after the initial seeding certain sections of the experimental area which had been left unseeded were cultivated to kill seedling wild oats. These were delayed-seeded to Olli barley. Two months following seeding, the plots were examined and scored for vigour and density of stand of crop and wild oats. The following appraisal is based on the data from this inspection since harvest data are not yet available. <u>Results</u>: Outstanding was the excellent control of wild oats obtained by delayed seeding. The percent vigor and density of the stand was as follows: Untreated controls; (1) early seeded crop 54(av. of 64 plots where crop was early seeded, 16 where delayed seeded), (2) delayed seeded crop 90; wild oats in (1) early seeded crop 36 and (2) in delayed seeded crop 6. Treated plots; (1) early seeded crop 36, (2) delayed seeded crop 81; wild oats in (1) early seeded crop 15; (2) in delayed seeded crop 4. Whereas the vigour of the stand of the early-seeded crops in the untreated plots was severely reduced by wild oat competition and that additional reduction occurred through the use of the chemicals, the stand of the delayed-seeded barley was little affected from wild oat competition and it escaped much of the residual effect of the chemicals. The data also show that the wild oat infestation was reduced to slightly less than half by chemical treatments, but to 1/6 by delayed seeding. Additional results: 1) The heavier rate of water increased the suppressive effect of the chemicals on the vigour of the different crops and on that of the wild oats. 2) The suppressive effect of CDAA on all crops was greatly increased by the heavier rate of chemical application. The same situation existed for CDEC except in the case of peas. Here the heavier rate suppressed the stand of this crop less than the lighter rate presumably because of the considerable relief it afforded from wild oat competition with apparently little injury to the

peas. 3) Increasing the rates of the chemicals greatly increased their effect on the wild oats. Even so, an 80% suppression was in no instance obtained. 4) CDAA had a stronger suppressive effect on the wild oats than CDEC, but also caused more injury to the cultivated crops. (Contribution of Experimental Farm, Beaverlodge, Alberta).

Pre-planting chemicals for the control of wild oats in grain crops. Carder, A. C. Eight chemicals, CDAA and CDEA at 5 and 10 lb/A active, IPC and CIPC at 10 and 15 lb/A, CMU at 2.5 and 5 lb/A and 2,4-D, MCPA and TCA at 15 and 25 lb/A were applied on October 28, 1955, to land heavily contaminated with a natural infestation of wild oats, two days before heavy snow and general freeze-up occurred. The chemicals were applied in water solution at 20 gal/A and within hours incorporated into the soil by double-discing crosswise. Temperatures were low but not freezing. On May 17, 1956, the area was seeded to Saunders wheat, Beaver oats, Redwing flax and Chancellor peas. Heavy rains shortly after induced good germination of the seeded crops and wild oats. Three weeks following this seeding, certain sections of the area which had been left unseeded were cultivated to kill seedling wild oats and delayed-seeded to Olli barley. Two months after seeding the plots were examined and scored for vigour and density of stand of crop and wild oats. The following appraisal is based on data from this inspection since harvest data are not yet available. Results: The only chemicals that gave any considerable control of wild oats were IPC, CIPC and MCPA. Increasing the rate of IPC increased the control from 88 to 92%. The effect of CIPC and MCPA on wild oats was less than that of IPC. IPC severely injured all the cultivated crops except peas where a high degree of selectivity was obtained. Less selectivity was obtained with CIPC, while MCPA seriously injured all cultivated crops. Of special note was the use of 2,4-D with cultivated oats. Other than somewhat delayed development of this crop the chemical did not affect it. The wild oats were controlled about 85%. There was little difference between the effects of the two rates. Where no chemical was applied delayed seeding of barley gave 90% control of wild oats. Little additional control was obtained by any chemical that did not injure the barley. The acetamides neither injured the cultivated crops or the wild oats. CMU was not selective, damaging the crops and wild oats to the same degree. TCA only slightly injured flax and peas but gave less than 50% control of wild oats in these crops. (Contribution of Experimental Farm, Beaverlodge, Alberta).

Wild oat control in flax. Dunham, R. S., Soine, O. C., Thompson, R. L., and Robinson, R. G. The following treatments were made: (1) pre-planting; DCU 10 or 20 lb/A; (2) pre-emergence; DCU 10 or 20 lb/A; CDAA 4 or 6 lb/A; or CP 9802 4 or 6 lb/A; (3) wild oats 4-5 leaf stage; ATA $\frac{1}{4}$, $\frac{1}{2}$, or 1 lb/A; (4) wild oats shot-blade stage; ATA $\frac{1}{4}$, $\frac{1}{2}$, or 1 lb/A; or (5) wild oats headed; ATA $\frac{1}{4}$, $\frac{1}{2}$, or 1 lb/A. The trials were located at Crookston and Morris where natural infestations of wild oats occurred. All plots were sprayed with MCP to control non-grass weeds. Results: CDAA and CP 9802 were the only treatments that gave any control of wild oats. The 6 lb rate of each was better than the 4 lb rate. Control was fair to good and resulted in a good flax crop. CDAA was superior to CP 9802 in flax yield. Oil content and iodine number were not depressed by CDAA. Treatments did not affect the percentage of fertile florets in the wild oats. Germination of the fertile florets was not importantly affected by any treatment. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3677, Sci. Jour. Series, Minn. Agric. Exp. Station).

The effects on wild oat growth of CIPC and CDAA applied in the fall and spring in combination with tilling. Ebell, L. F., Vanden Born, Wm., and Corns, Wm. G. A heavy stand of wild oats was allowed to shatter, following which the straw was removed. Treatments were applied Oct. 11, 1955, and May 14, 1956. The sequence of treatments together with the results from the fall application are shown:

Sequence of treatments	CIPC 5 lb/A	CIPC 10 lb/A	CDAA 5 lb/A	CDAA 10 lb/A
	Percent Control			
I rototilled - sprayed	0	60	60	60
II sprayed - rototilled	90	95	30	40
III rototilled-sprayed-rototilled	80	90	0	0
IV sprayed only	poor growth		0	0

The residual effect of fall applied CDAA did not persist as long as that of CIPC. Escapes and later growth thickened the stand to the extent that no degree of control was evident on the CDAA plots one month after emergence. Spring applied CDAA was much superior to fall applied CDAA, and at 10 lb/A gave good control in tillage treatments II and III. With tillage treatment II CIPC at 10 lb/A gave excellent control, while the 5 lb/A rate was less effective. Tillage treatment III was much less effective than II for both rates of this chemical. Unsprayed, tilled areas showed the desirability of late fall tillage in promoting spring germination of wild oats. (Division of Crop Ecology, Dept. of Plant Science, University of Alberta).

Effect of CDAA for wild oat control in wheat. Friesen, George and Canvin, D. T. CDAA was applied as a pre-planting treatment to a wild oat infested field intended for a wheat crop. Liquid CDAA was used at 2 and 4 lb/A, and granular CDAA at 4 lb/A. Selkirk wheat was sown at four dates after treatment (D-1, 0-days; D-2, 7 days; D-3, 14 days; D-4, 21 days). Results: Wild oat control was virtually complete in all treated plots. Wheat yields were as follows:

Treatment	D-1	D-2	D-3	D-4
Check	36.4	35.6	31.4	22.5
CDAA (Liquid) 2 lb/A	19.2	25.6	27.6	50.2
CDAA (Liquid) 4 lb/A	8.4	10.3	24.8	48.2
CDAA (Gran.) 4 lb/A	10.6	17.0	21.8	22.0

Liquid CDAA at both rates reduced the wheat yields if sown within 2 weeks after treatment. Three weeks after treatment the effects of the herbicide had apparently disappeared and significant yield increases were recorded. The granular CDAA was more persistant and reduced wheat yields even if seeding was delayed for three weeks after treatment. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg).

Effect of CDAA for wild oat control in barley. Friesen, George and Canvin, D. T. Experiment I. Liquid CDAA was applied as a pre-planting treatment at 3 and 6 lb/A to a wild oat infested field. Parkland barley was then sown at 2 dates after treatment. (Date - 1, 7 days; D - 2, 14 days). Results: Wild oat control was virtually complete in all treated plots. Check plots were heavily infested with the weed. Barley yields were as follows: Weedy check 26.9 bu; CDAA 3 lb, 30.7 bu; CDAA 6 lb 22.7 at first date of sowing. For second date, yields were 26.8, 40.2, and 37.1 bu respectively.

CDAA at 3 lb/A was the most promising rate. The losses from wild oat competition were greater than those from herbicidal effects, if any. The 6 lb/A rate resulted in losses greater than those from weed competition unless seeding was delayed for 2 weeks. Experiment II. In a second experiment liquid CDAA was applied at 2 and 4 lb/A, and granular CDAA at 4 lb/A, both as pre-planting treatments. Parkland barley was sown at 5 dates after treatment. Wild oat control was again

virtually complete in all treated plots. Barley yields in bu/A were as follows:

Treatment	Seeding date after treatment				
	0 days	5 days	10 days	15 days	20 days
Weedy check	40.6	50.0	35.1	9.9	11.4
CDAA (Liq.) 2 lb/A	56.1	66.7	47.2	32.6	23.2
CDAA 4 lb/A	45.4	58.1	36.3	39.1	28.7
CDAA (Gran.) 4 lb/A	51.1	66.7	34.0	22.7	26.0

Treatment with CDAA resulted in increased barley yields at all dates of sowing. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg.)

Selective control of wild oats in flax. Friesen, George and Canvin, D. T. On May 24, 1956, CDAA was applied at 2 and 4 lb/A to a heavy clay, loam soil infested with wild oats. Granular CDAA was broadcast at 4 lb/A. All herbicides were incorporated into the top 2 - 3 inches of soil with a rototiller. Raja flax was sown at 5 dates after treatment (D_0 - same day, D_1 - 5 days, D_2 - 11 days, D_3 - 18 days, D_4 - 25 days). Granular CDAA was also applied at 8 lb/A as a pre-emergence treatment. This was applied at two stages, A - immediately after seeding the crop, B - just prior to emergence of the crop. Results: Wild oat control in all treated plots was virtually complete, with only an odd plant surviving. The selectivity of CDAA is shown by the following flax yields.

Pre-planting Treatment

Treatment	Flax yields Bu/Acre				
	D_0	D_1	D_2	D_3	D_4
Check	4.1	1.9	4.2	1.5	2.0
CDAA 2 lb/A	14.1	8.3	13.5	19.3	17.4
CDAA 4 lb/A	22.0	15.5	13.6	22.0	16.0
Granular CDAA 4 lb/A	22.8	12.0	15.4	21.5	15.3

In the pre-emergence treatment with granular CDAA, flax yielded 23.5 bu/A on the treated plot and 8.9 on the check when CDAA was applied immediately after sowing flax. When the CDAA was applied just before emergence of the crop, flax yielded 23.2 and 10.7 bu/A respectively. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg).

Comparison of several herbicides applied in the fall for control of wild oats in grain fields. Friesen, George. During the fall of 1955 (October 7 to October 25) six experiments were laid out on widely scattered farms in Manitoba for the purpose of comparing the effectiveness of several chemicals in controlling wild oats. Straw was removed from experimental areas to facilitate incorporation of chemicals. Herbicide treatments included IPC, 8 and 12 lb/A; CIPC, 8 and 12 lb/A; CDAA, 5 and 10 lb/A; TCA, 15 lb/A; dalapon, 15 lb/A; amine salt of MCPA amine each at 10 lb/A; various experimental dithiocarbamates, acetamides, carbamates, and benzoic acids. A plot sprayer delivering 10 gal of total volume/A was used. The herbicides were incorporated with disc type machinery. During the spring of 1956 cereal crops and flax were seeded on the plots. Four dates of seeding were used in one experiment. Results: can be briefly summarized as follows: IPC and CIPC at 8 lb/A did not give

satisfactory wild oat control. At 12 lb/A these herbicides gave excellent control of wild oats but cereals and flax were damaged if seeded early. Residual toxicity of CIPC was considerably longer than that of IPC. TCA at 15 lb/A gave good wild oat control in most experiments but only flax could be grown in these plots in 1956. The amine salt of 2,4-D at 25 lb/A gave virtually complete control of wild oats throughout 1956. Cereal crops grew normally in these plots regardless of seeding date but flax was damaged. In general this was the most promising treatment. The amine salt of MCPA (25 lb/A) also gave excellent control of wild oats but no crops survived this treatment. Results with dalapon were erratic. Other treatments either did not give satisfactory wild oat control or seriously damaged the crop plants. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg).

Pre-planting application of acetamides and other herbicides for the control of wild oats. Friesen, H. A. On May 22, CDAA, CDEC, and methyl-N-(3 chlorophenyl)-carbmate (CMPC) were applied on a plot area which had been fallowed the previous year. Rates of application given as active ingredient, were CDAA 2, 4 and 8 lb/A; CDEA 4 lb/A; CDEC 4 and 8 lb/A and CMPC 6 and 8 lb/A. Immediately after spraying the plots were worked twice with a one-way disc to a depth of 3 - 4 inches. On May 23, 1956 wheat, barley, oats and flax were seeded across the treated strips; a second seeding of these crops was made on June 7. Results: Although the plot area carried a long history of heavy wild oat infestation the combination of tillage and dry weather after spraying prevented sufficient emergence to permit assessment of the relative effectiveness of the treatments for wild oat control. Generally the treatments were more severe on the crop seeded at date 1 than at date 2. Wheat and flax were decidedly sensitive to CDAA each date when treated at the 4 and 8 lb/A rates. Oats and barley were little affected at either seeding date. The crops reacted in a similar way to CDEC but the stand reductions were much less severe. CDEA and CMPC at the rates used had little effect on the crop. (Contributed by the Experimental Farm, Lacombe, Alta.)

Comparison of several herbicides applied in the fall and in the spring for the control of wild oats. Friesen, H. A. On October 7, 1955 various herbicides were sprayed on barley stubble, the area carried a very heavy natural infestation of wild oats. The herbicides used were IPC and CIPC each at 10 lb/A; CDAA, CDEA, CDEC, 2,3,6-TBA (H.C.1281), polychlorobenzoic acid (X-42-EO) and (X-32-EO) each at 6 lb/A; isopropyl and sec-Butyl N-(3- methylphenyl) carbamate 5518 and 5519, respectively, at 8 lb/A; MCP butyl ester at 25 lb/A; 2,4-D butyl ester at 10 and 25 lb/A; and DB spray at 25.2 and 33.6 lb/A equivalent of 2,4-D. Immediately after spraying one-half of each plot was one-way disced. On May 17, 1956, IPC at 10 lb/A; CDAA, CDEA and CDEC at 8 lb/A; H.C.1281 and 5518 were each applied at 6 lb/A to plots in this test area, thus making a total of 25 treatments, replicated 4 times. One-half of each plot was one-way disced directly after the spring application. On May 29 all plots were one-way disced and then seeded to Olli barley. Results: The wild oat infestation was variable. On the untreated check plots it averaged 294 plants/sq yd, but reached 700 plants/sq yd on some of the treated plots. Incorporation of the chemicals with the one-way disc very materially influenced their effectiveness, whether the spraying was done in the fall or in the spring. Indeed, with only a few exceptions, where the herbicides were not incorporated into the soil they were largely ineffective. IPC and CIPC applied in the fall reduced the wild oat stand by some 50% with no apparent injury to the barley. IPC applied in the spring killed more wild oats but reduced the barley stand by over 50%. The CDAA and CDEC, gave only slightly better control than IPC at either date of application, however they did not result in crop injury when applied in the spring. CDEA was ineffective as a fall treatment. 2,4-D at each rate resulted in over 50% of the wild oat plants being killed, MCP at 25 lb/A killed some 70% of the wild oats but unlike 2,4-DE it

killed 50% of the barley. DB resulted in little or no control of the wild oats. The benzoic acids, compounds H.C.1281, X-42-EO and X-33-EO resulted in marked reductions in the stand of both the wild oats and barley. The carbamates 5518 and 5519 applied in the fall were effective but reduced the stand of barley by 30%. 5518 applied as a pre-planting treatment eliminated both the weed and the crop. (Contributed by the Experimental Farm, Lacombe, Alta.).

Selective control of wild oats in Olli barley with MH. Friesen, H. A. and Walker, D. R. Expt. I In 1955, MH was sprayed on wild oats in Olli barley at 6, 8 and 12 oz/A active ingredient. Spraying was done at 6 stages of wild oat growth, viz: 1. headed, but anthers green, 2. early panicles flowered 3. kernel forming, 4. early milk, 5. milk and 6. stiff dough stage. Samples of barley and wild oats from each plot were sent for germination trials to the Plant Products Laboratory, Calgary, Alta. Due to variation in maturity between the early and late wild oat tillers, double sampling was carried out. Thus, sample A was taken from early while sample B was taken from the late tillers. Results: Treatments at stages 4 and 5, early milk and milk stage, respectively, resulted in no germinable wild oats seeds where the samples were taken from the mature panicles, except that the 6 oz/A rate used in early milk stage resulted in 1% germination from the early and 10% germination from the late panicles. At stages 1, 2 and 3 germination was upwards of 30% for dosages of 6 and 8 oz/A; following the 12 oz/A dosage germination was lower, but not satisfactorily so. At stage 6, germination was equal to that of the untreated check regardless of dosage. Barley germination was reduced by all treatments made during stages 1 to 3; at stages 4 and 5 it was seriously reduced by the 12 oz/A treatment, while at stage 6 germination was not affected. In 1956, the area was again sown to Olli barley. The outlines of the plots treated at stages 4 and 5 were clearly discernable due to their much lighter wild oat infestation in 1956.
Expt. II In 1954 a two-acre plot, which has carried a heavy wild oat infestation for many years, was sown to Olli barley and sprayed with MH at 8 oz/A when the weed was assessed to be in the milk stage. This treatment was repeated in 1955 and again in 1956. In 1954 and 1955, tests indicated that wild oats seeds from the treated area were only 22 and 21% germinable, respectively. In 1956 no definite reduction in the number of wild oats in the barley crop could be observed as a result of the MH treatments. (Contributed by the Experimental Farm, Lacombe, Alta.).

Cultural and fertilizer practices for the control of wild oats. Friesen, H. A. and D. R. Walker. In 1956 the cultural and fertilizer practices outlined in the table were carried out on plots which had received similar treatment in each of 1954 and 1955. Results: In 1956 delayed seeding markedly reduced the number of wild oat plants per square yard. The application of 50 lb/A of ammonium phosphate 11-48-0 had little effect on the number of wild oats, especially when seeding was delayed. Fall tillage with a one-way disc in mid-October of 1955 on a portion of each plot had no effect on the numbers of wild oats. The yield of barley was significantly higher where the seeding was delayed - this w as due in part to the very dry conditions which prevailed until mid-June and in part to the reduced wild oat competition. The phosphate fertilizer significantly increased the yield of barley at both dates of seeding.

The effect of the treatments on the number of wild oat plants in each of the 3 years in which this test has been in operation, has followed the trend shown in the table. The 3 year average yields definitely favor delayed seeding of Olli barley for wild oat control, although in the cool, wet season of 1954 the highest yields were obtained following the early seeding.

Date sown	Fertilizer	One-way disced in fall	Wild oat plants/sq yd 1956	Wild oat 3 yr Av	Barley yield bu/A 1956	Barley 3 yr Av
Normal	50 lb/A 11-48-0	No	105	45	42.2	46.5
"	"	Yes	118			
"	none	No	132	67	35.5	43.7
"	"	Yes	134			
Delayed	50 lb/A 11-48-0	No	55	20	56.0	56.1
"	"	Yes	62			
"	none	No	52	24	52.5	50.4
"	"	Yes	58			
L.S.D. for Date of Seeding					5.9	
L.S.D. for Fertilizer Treatment					3.8	

(Contributed by Experimental Farm, Lacombe, Alberta).

Cultural control of green foxtail (Setaria viridis). Keys, C. H. The area at Conquest Sask. used for this experiment in 1955 was used again in 1956 and the treatments were duplicated on fallow crop. Treatments consisted of A- normal date of sowing: (1) rod weeder used pre-emergence (2) harrow used pre-emergence (3) harrow used post-emergence (4) rod weeder pre-emergence plus harrow post-emergence (5) no treatment and B- (1) rod weeder pre-emergence plus harrow post-emergence (2) no treatment. Results: There was very little difference in weed control between treatments in stubble crop. There were more weeds in the early seeding but the plants were much smaller than in the delayed seeding treatments. Analysis showed no significant differences between treatments in either crop yield or weed score. A comparison of weed infestation in fallow crop with that of stubble crop indicated that fallowing had reduced the infestation from 96% of check in the stubble crop treatments to 82% of check in the fallow crop treatments at normal date of sowing and the yield of the crop was two or three times that of the stubble crop. There was some variation between treatments in fallow crop; delayed seeding resulted in an increased weed infestation with a limited amount of control as a result of post-seeding tillage. At the normal seeding time, post-emergence harrowing seemed to be the most effective treatment. This agreed with the previous years results. (Contribution from Experimental Farm, Scott, Sask.).

Weed control in fine turf. Matthews, L. J. The main weeds that infest low fertility browntop, (Agrostis tenuis) chewings fescue (Festuca rubra var. fallix) turf under optimum conditions of pH 5 are resistant to sulphate of ammonia and close mowing - clovers, Sagina, Netera, Hydrocotyle, Soliva and the bryophytes, Bryum, Brachythecium, Lophocolea, and Lepidozia. The broadleaved weeds are best controlled by a 1 lb rate of an ester of MCP, plus a 2 lb rate of an ester of 2,4, 5-T/A which is required for clover control. Formulations of both these acids may be applied to browntop and chewings fescue as early as the seedling stage. All preparations of 2,4-D are more damaging particularly to the more susceptible browntop. Bryophytes are resistant to MCP and 2,4,5-T, but can be controlled by the sodium salt of PCP, at 4 to 8 lb/A. This treatment causes slight disfigurement.

Detailed work has shown that weedkillers for turf maintenance are subsidiary in function to the correct manurial practices - a 3:1 mix of sulphate of ammonia and superphosphate applied at up to 9 cwt annually, lime being used to restore the pH to 5 when over-acidification takes place. Moss control is unsatisfactory unless followed by the application of 3:1 mix. Further work is required on the eliminatio

of Poa annua - the carbamates, TCA and dalapon are too toxic on browntop and chewings fescue to be used. Neburon may show possibilities. (Weeds Research Officer, Dept. of Agri., New Zealand).

Control of wild oats in crops with pre-planting treatments. Molberg, E. S. and Leggett, H. W. CDAA, CDEA and CDEC were applied in the spring to stubble and fallow land which was then cultivated and seeded immediately to wheat, oats, barley and flax. The rates used were 4 and 8 lb/A applied in 5 and 10 gal water/A. CDEC was also applied at 12 lb/A, and a granular form of CDAA was used at rates of 8 and 24 lb/A. Results: CDAA gave highly significant decreases in wild oats from all treatments. CDEC also gave highly significant decreases for all but one treatment, but the reductions were less than for equivalent rates of CDAA. CDEA was also less effective than CDAA. Better results were usually obtained when applied in 5 gpa than in 10 gpa. Although these chemicals reduced the wild oats from 5% to 84%, there were still 25 or more wild oat plants per square yard. The treatments did not seriously damage the crops. (Contributed by The Dominion Experimental Farm, Regina, Sask.).

Fall applications of CDAA and CDEA for wild oats. Molberg, E. S. and Leggett, H. W. CDAA and CDEA were applied at 4 lb and 8 lb/A to stubble land with a heavy infestation of wild oats in the fall of 1955. The plots were one-way disced and packed immediately after application. Treatments were made in duplicate on plots 1/30 A in size. In 1956 the plots were sown to barley. Results: The 8 lb rate of CDAA was the only treatment that reduced the number of wild oats, and there was a marked increase in yield from this treatment. The 8 lb rate of CDEA did not reduce the wild oat infestation, and caused a decrease in the yield of barley. The wild oat plants/sq yard, followed by yield in bu of clean barley in brackets were as follows for the various treatments. 4 lb CDAA 103.9 (13.3); 8 lb CDAA, 53.6 (35.3); 4 lb CDEA, 85.5 (16.0); 8 lb CDEA 96.9 (9.2); Check 83.9 (13.8). (Contributed by Dominion Experimental Farm, Regina, Sask.).

Residual effect of temporary soil sterilants for wild oats. Molberg, E. S. and Leggett, H. W. Wild oat counts were made in 1956 in plots which had been treated with temporary soil sterilants in the spring and fall of 1954. The chemicals used were CIPC, IPC, endothal, dalapon, TCA and 2,4-D. The CIPC, IPC and dalapon showed some residual effect. Somewhat more residual effect was obtained from the spring treatments than from the fall treatments. Results: The treatments which gave significant residual effects, and the wild oat plants/sq yard in 1956 were as follows: Spring applications: CIPC at 25 lb/A 15.8; CIPC at 45 lb/A 16.1; IPC at 15 lb/A 15.9; IPC at 35 lb/A 17.0; IPC at 45 lb/A 17.4; dalapon at 20 lb/A 16.4; check 29.1. Fall applications: CIPC at 35 lb/A 6.8; CIPC at 45 lb/A 4.6; IPC at 45 lb/A 5.4; check 11.6. (Contributed by Dominion Experimental Farm, Regina, Sask.).

MCPA vs 2,4-D at heavy rates for wild oat control. Molberg, E. S. and Leggett, H. W. Butyl esters of MCPA and 2,4-D were applied to wild oat infested land in October, 1955. The chemicals were applied at rates of 5, 15 and 25 lb/A in 10 gal water, and then one-way disced and packed. The test was conducted in quadruplicate plots 12 ft by 55 ft. Results: Considerable damage was done by spring flooding, but the wild oats were significantly reduced by the 15 and 25 lb rates of both MCPA and 2,4-D. There were fewer wild oats on the 2,4-D plots than the MCP plots, but these differences were not significant. The number of wild oats/sq yard for the different treatments were as follows: 5# 2,4-D 34.6; 15# 2,4-D 20.1; 25# 2,4-D 13.4; 5# MCPA 38.2; 15# MCPA 28.4; 25# MCPA 20.8; check 46.9. L.S.D. 5% level 14.8. (Contributed by Dominion Experimental Farm, Regina, Sask.).

Effect of rate of application of 2,4-D and amount of subsequent tillage on wild oats. Molberg, E. S. and Leggett, H. W. A butyl ester of 2,4-D was applied at rates of 5, 10, 15, 20 and 25 lb/A. One set of plots was one-way disced once and another set twice. Treatments were made in quadruplicate on plots 12 ft x 55 ft in October, 1955. The plots were sown to wheat in 1956. Results: Reductions in wild oats were highly significant from the 15, 20 and 25 lb rates. The reduction from the 10 lb rate was significant when one-way disced twice only. On the whole, better results were obtained when one-way disced twice, but the difference was significant only at the 20 lb rate. The wild oat plants/sq yard for each treatment were as follows. One-way disced once: 5 lb 12.1; 10 lb 8.1; 15 lb 3.1; 20 lb 5.8; 25 lb 2.9. One-way disced twice; 5 lb 10.9; 10 lb 7.4; 15 lb 5.2; 20 lb 1.8; 25 lb 1.6; check - no 2,4-D tillage 11.2 L.S.D. 5% level 3.2, 1% level 4.4. (Contributed by Dominion Experimental Farm, Regina, Sask.).

Cultural treatments for wild oats control. Molberg, E. S. and Leggett, H. W. Wheat and barley were sown at heavy and light rates, with and without fertilizer at two dates on land infested with wild oats. In 1953, Thatcher wheat and Vantage barley were used; and since that time the varieties have been Selkirk and Olli. The wheat was sown at 2½ and 1¼ bu/A and the barley at 3 and 1½ bu/A. The fertilizer used was 50 lb 11-48-0/A. In 1953 and 1954 the late seeding was made 5 weeks after the early seeding. In 1955 seeding was delayed 2 weeks, and in 1956 3 weeks. Results: The 4-year average reduction in wild oats from delayed seeding was 98% for wheat and 99% for barley. The average reduction from heavy seeding was 3% for wheat and nothing for barley. The fertilized wheat contained 60% less wild oats than the non-fertilized, while the fertilized barley had 6% more than the non-fertilized. Sowing barley instead of wheat reduced the wild oats by 53%. (Contributed by the Dominion Experimental Farm, Regina, Sask.).

Effect of time of cultivating stubble land after harvest on wild oats. Molberg, E. S. and Leggett, H. W. Stubble land infested with wild oats was tilled with a discer at three dates in the fall of 1955. Wild oat seeds were collected from these plots the day of cultivation, and tested for germination. In 1956 the plots were sown to barley, and wild oat counts and yield tests of the barley were made. The dates of fall tillage were Sept. 20, Oct 5 and Oct 25. The germination tests indicated that the wild oats germinated more readily early in the fall than in late fall and early spring. There was little difference in yields of barley between the Oct 5, Oct 25 and check treatments. The Sept 20 tillage resulted in lower yields and more dockage in the grain. (Contributed by the Dominion Experimental Farm, Regina, Sask.).

Effect of stubble treatments on wild oats. Molberg, E. S. and Leggett, H. W. Marked differences in wild oat infestations in wheat were observed in a stubble treatment project between the different tillage treatments. Counts were made in six of the twelve replicates. The experiment has a split plot design, with 4 fertilizer treatments being used on the 9 cultural treatments. Results: The average number of wild oat plants/sq yard for the different cultural treatments were as follows: Burn stubble in fall, no cultivation, 19.0; Chop straw in fall, no cultivation 28.4; burn stubble in fall, duckfoot 38.6; check-no treatment 40.8; heavy duty cultivator in fall 41.1; one-way disc in fall 46.3; burn stubble in spring 51.8; chop straw and one-way disc in fall 55.0; plow in fall 76.0. The average no. of wild oat plants/sq yard for the fertility treatments were: check-no fertilizer 48.8; 150# 33.5-0-0 46.5: 100# 16-20-0 42.0; 150# 33.5-0-0 and 48# 11-48-0 mixture 41.0. The L.S.D. at 5% and 1% levels were 18.2 and 24.0. (Contributed by Dominion Experimental Farm, Regina, Sask.).

Pre-seeding application of herbicides for the control of wild oats (Avena fatua). Sexsmith, J. J. On May 11, 1956, wild oat seed was broadcast and disked into silty clay loam irrigated soil, known to be lightly infested with wild oats. Herbicides were applied to the soil surface of duplicate plots on May 15 and immediately disked-in, and thirteen crops were seeded into each plot the following day. Treatments included were: DCU at 5 and 10 lb/A; IPC, BCPC, and (1-chloropropyl-2) N-(3-chlorophenyl)carbamate (CPCPC) at 4 and 8 lb/A; CDAA at 2,4, and 6 lb/A; and CDEC at 4 lb/A. DCU was applied at a solution rate of approximately 190 gal/A; all other chemicals were applied at a solution rate of 21.2 gal/A. Germination and growth of the various crops were too poor to determine reaction to treatments. Estimates of wild oat control were taken two months after treatment. Results: No control of wild oats was obtained with either rate of DCU or with the 2-lb rate of CDAA. Control from the 4- and 8-lb rates, respectively, were as follows: IPC, 50% and 75%; BCPC, 50% and 40%; CPCPC, 20% and 40%. The 4- and 6-lb rates of CDAA gave 15% and 25% control, whereas the 4-lb rate of CDEC gave 50% control. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta. Approved for Publication).

Pre-emergence application of herbicides for the control of wild oats (Avena fatua). Sexsmith, J. J. On May 11, 1956, wild oat seed was broadcast and disked into silty clay loam irrigated soil, known to be lightly infested with wild oats. On May 16, thirteen crops were seeded into each plot. The following treatments were applied to the soil surface of duplicate plots on May 17: monuron at 1 and 2 lb/A; neburon at 2 and 4 lb/A; dalapon and ATA at 6 and 12 lb/A; and TCA at $7\frac{1}{2}$ and 15 lb/A. Dalapon and TCA were used in the sodium salt form. Monuron and neburon were applied at a solution rate of approximately 190 gal/A; the other materials were applied at a solution rate of 21.2 gal/A. Germination and growth of the various crops were too poor to determine reaction to treatments. Estimates of wild oat control were taken two months after treatment. The first rain of any consequence occurred on June 4 when 0.59 inch of precipitation was recorded. Results: Wild oat control was estimated to be 20% and 65% for monuron at 1 and 2 lb/A, and 35% and 75% for dalapon at 6 and 12 lb/A. All wild oat plants present on the dalapon-treated plots were seriously stunted and slightly delayed. No evidence of control was obtained with neburon, ATA, or TCA at the rates used. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta. Approved for Publication).

Pre-seeding application of herbicides for the control of green foxtail (Setaria viridis). Sexsmith, J. J. On May 11, 1956, green foxtail seed was broadcast and disked into silty clay loam irrigated soil, known to be lightly infested with green foxtail. Herbicides were applied to the soil surface of duplicate plots on May 15 and immediately disked-in, and thirteen crops were seeded into each plot the following day. Treatments included were: DCU at 5 and 10 lb/A; IPC, BCPC, and (1-chloropropyl-2) N-(3-chlorophenyl)carbamate (CPCPC) at 4 and 8 lb/A; CDAA at 2, 4, and 6 lb/A; CDEC at 4 lb/A. DCU was applied at a solution rate of approximately 190 gal/A; all other chemicals were applied at a solution rate of 21.2 gal/A. Germination and growth of the various crops were too poor to determine reaction to treatments. Estimates of green foxtail control were taken two months after treatment. Results: The control of green foxtail was estimated at 50% and 80% for the 5- and 10-lb rates of DCU, and 10%, 15%, and 40% for the 2-, 4-, and 6-lb rates of CDAA. Control was rated as 0% for all other materials at the rates used. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta. Approved for Publication).

Pre-emergence application of herbicides for the control of green foxtail (Setaria viridis). Sexsmith, J. J. On May 11, 1956, green foxtail seed was broadcast and disked into silty clay loam irrigated soil, known to be lightly infested with green foxtail. On May 16, thirteen crops were seeded into each plot.

The following treatments were applied to the soil surface of duplicate plots on May 17: monuron at 1 and 2 lb/A; neburon at 2 and 4 lb/A; dalapon and ATA at 6 and 12 lb/A; and TCA at $7\frac{1}{2}$ and 15 lb/A. Dalapon and TCA were used in the sodium salt form. Monuron and neburon were applied at a solution rate of approximately 190 gal/A; the other materials were applied at a solution rate of 21.2 gal/A. Germination and growth of the various crops were too poor to determine reaction to treatments. Estimates of green foxtail control were taken two months after treatment. The first rain of any consequence occurred on June 4 when 0.59 inch of precipitation was recorded. Results: Green foxtail control was estimated to be 0% and 35% for monuron at 1 and 2 lb/A, 65% and 80% for dalapon at 6 and 12 lb/A, and 70% and 80% for TCA at $7\frac{1}{2}$ and 15 lb/A. All existing plants on the dalapon-treated plots were seriously stunted, and on the TCA plots there were a few green foxtail seedlings. No control was obtained from the two rates of neburon or the 6-lb rate of ATA, and a questionable 25% to 30% control was credited to ATA at the 12-lb rate. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta. Approved for Publication)

Fall applications of IPC dissolved in anhydrous ammonia for wild oat control. Wilson, M., and Friesen, George. Since anhydrous ammonia is an excellent solvent for technical IPC, the cost of IPC applied in this way would be greatly reduced and crops would have the benefit of nitrogen fertilization. To study the effectiveness of IPC dissolved in anhydrous ammonia in controlling wild oats, an experiment was started in the fall of 1955. The solution was applied on October 27, 1955 to heavy clay soil infested with wild oats. The rate of application was 10 lb/A of IPC dissolved in 40 lb/A of anhydrous ammonia. Application was made with an ammonia applicator with knives placed 12 in apart. Plots were 12 ft by one-half mile. Flax was seeded on the field in 1956. Wild oat counts and flax yields in 1956 are presented in the following table:

	Wild oat plants per square yard	Flax yields bu/A
Untreated check	6.3	11.0
Anhydrous ammonia only	10.4	15.4
Anhydrous ammonia plus IPC	10.2	15.0

The ineffectiveness of IPC when applied in this way was probably due to recrystallization after leaving the applicator resulting in poor distribution in the soil. The recrystallization was quite evident at time of application. Possibly a thorough discing following treatment would have produced more favorable results. It is interesting to note the increased incidence of wild oats following nitrogen fertilization. This was more pronounced by field observation than the counts would indicate. (Contribution from Division of Plant Science, University of Manitoba, and Harrisons and Crosfield (Canada) Limited, Winnipeg).

Effect of carrier on the toxicity of dalapon to wheat, sorghum and millet. Wiese, A. F. and Rea, H. E. In an effort to increase the phytotoxicity of dalapon for use in a chemical fallow program, the chemical was applied at 0.5, 1.0, 2.0 and 4.0 lb/A in several carriers to greenhouse pots containing wheat, sorghum and millet plants about 1 in tall. Ten seeds of each crop were planted. The experimental design was a split plot with 3 replications. All of the carriers affected each crop similarly; as a result, only the results on the wheat are given. Results: The average (4 rates) number of live wheat plants per pot 3 weeks after treatment with 80 gallons of water per acre as carrier was 9.0, and where $\frac{1}{2}$% Dynawet was added to the

water, the number was 8.0. Plants per pot where Dynawet was used at ½% to make an oil in water emulsion (60 gal of water and 20 gal of oil per acre) with Diesel oil, kerosene and naphtha were 7.2, 8.3 and 6.8, respectively. Where Triton GR7 was used at 1-½% to make a water in oil emulsion (60 gal of water plus 20 gal of oil per acre) with Diesel oil, kerosene and naphtha, the number of wheat plants per pot was 3.0, 6.1 and 3.4, respectively. The check pots had 9.1 plants, and pots treated with a water in kerosene emulsion made with 1-½% Triton GR7 containing no dalapon averaged 8.8 plants. The least significant difference at the 1 percent level was 1.8 plants per pot. (Contribution of the Amarillo Experiment Station, Bushland, Texas, USDA and Texas Agricultural Experiment Station cooperating.) Approved as TAES T.A. 2510.

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Annual, Winter Annual, and Biennial Broad-leaved Weeds

Summary . Thor Kommedahl

One-third of the 35 abstracts in this section pertain to wild buckwheat. Keys found that the best control was obtained with double applications of butyl ester or low volatile formulations of 2,4-D. In addition to the latter, Forsberg included 2,4-DE and MCPE as effective. However Selleck reported both low volatile and ester formulations of 2,4-D as being ineffective. Butyric formulations were also ineffective according to Forsberg. Brown found that double applications of the butyl ethyl ester of 2,4-D gave 75% control at early stages of growth and 45% at later stages. However some injury occurred on wheat. The addition of the butyl ethyl ester of 2,4-D to other herbicides gave control of wild buckwheat plus higher yields of barley. Pre-emergence applications of ATA, 2,4-DE and the low volatile ester of 2,4-D in combination, gave excellent control but injured wheat at high rates of application. The butyl ester of MCP, applied twice after spring cultivation was effective in controlling wild buckwheat.

Best control of Russian thistle seedlings without injuring spring wheat was obtained with 2,4-D; the ester was effective at 4 to 16 oz/A (Selleck reports 8 oz/A), the acid at 4 or 8 oz/A, and where sprayed twice, the acid at 4 oz/A, according to Sexsmith. Selleck adds the butyl ester form of 2-(2,4-DP), at 8-16 oz/A. as effective in control. In Shafer's work, ATA-monuron combined, when applied 1 month after spraying with 2,4-D, controlled Russian thistle on undisturbed land.

For cow cockle, no herbicide tested by Selleck gave better control than the ester of 2,4-D. For blue bur control, only the low volatile ester of 2,4-D was satisfactory.

To control the scentless mayweed (Matricaria inodora), Carder found that 2,4-D at 6 lb/A was most selective in killing the mayweed in a red fescue pasture. ATA was most effective in work by Molberg.

Cocklebur was controlled by using either 2,4-D or MCP at 4-8 oz/A. Neither of these two herbicides could be used to kill wilt mustard in rapeseed without injury to rape.

Blanchard found that hoary alyssum in red clover could be completely controlled using the ester of MCP or the amine of 2,4-D, at ½-1 lb/A, and that 2,4-D butyric at 1.5 lb/A was effective and did not injure red clover. He also found that CDT controlled white cockle at least 70-80% with little damage to red clover. In a one-year-old stand of brome-alfalfa, neburon was ineffective against white cockle.

Good control of Kochia was obtained with the amine of MCP and with ATA, both at 1.5 lb/A. Also the low volatile ester of 2,4-D, CDT and polychlorobenzoic acid at 1 lb/A, were effective according to Blanchard. Kochia was also controlled by treating first with 2,4-D, then following 1 month later with a combination of ATA and monuron.

Russian pigweed was controlled satisfactorily in Saskatoon, using the ester, amine and low volatile formulations of 2,4-D, and to a lesser extent with ATA and dalapon. However, the sodium-potassium salt of MCP and the amine form of 2,2 (4,5-TP) proved to be better even than the ester of 2,4-D.

According to Selleck the ester of 2,4-D kills pigweed while other herbicides such as ATA, MCP, dalapon, TCA, and the amine and low volatile formulations of 2,4-D were ineffective. However Shafer found that fall application of ATA and monuron was effective for pigweed and for lambs quarters.

Sexsmith reports that stinkweed (Thlaspi arvense) was controlled with the sodium and potassium salt of MCP at 4 or 8 oz/A. Best found that the ester of 2,4-D failed to kill stinkweed in flax when the weather was hot and dry; however a second application when stinkweed was growing vigorously effectively controlled this weed.

According to Vanden Born, the low volatile ester of 2,4-D was better than the standard ester for the control of tartary buckwheat, and both esters were superior to the ester of MCP at the lower rates of application. However Friesen found that neither the butyl esters of MCP and 2,4-D nor the low volatile esters of 2,4-D, were effective in controlling tartary buckwheat. Instead, neburon at 5.4 lb/A completely controlled this weed without injury to barley.

Friesen also reported that neburon at 1.8 to 10.8 lb/A killed seedlings of corn spurry; however the higher rates injured wheat. Blanchard reported 100% control of spurry using CMU at 1.5 lb/A, CDT at 4 lb/A, and polychlorobenzoic acid at 6 lb/A. Also, the acetamides of both 2,4-D and 2,4,5-T, at 3 lb/A, gave 85-95% control.

Abstracts

Control of stinkweed (Thlaspi arvense). Best, K. F. During the spring of 1956, a field of flax was sprayed with an ester of 2,4-D at the rate of 3 oz/A. The stinkweed was in flower; some had already set seed. The flax was in the six-leaf stage and the weather was hot and dry. Good kills were noted on such weeds as Russian thistle and the pigweeds, but the stinkweed was not affected. A short time later, after growing conditions had improved and the stinkweed was growing vigorously, the field was again sprayed with 3 oz of 2,4-D ester. This time the previously resistant stinkweed was killed. (Contributed by Experimental Farm, Swift Current, Sask.)

Comparison of various herbicides for control of hoary alyssum (Berteroa incana) in red clover. Blanchard, K. L. and Dunham, R. S. A moderate, but uniform infestation of hoary alyssum, growing in a 3-year-old red clover-quack-grass pasture near Menahga, Minnesota was treated on May 21, 1956 with (1) 2,4-D amine, (2) 2,4-D ester, (3) MCP amine and (4) MCP ester, all at 0.25, 0.5, 0.75 and 1 lb/A, and (5) 2,4-D butyric at 0.5, 1.0, 1.5 and 2 lb/A, (6) polychlorobenzoic acid at 1.0, 2.0, 4.0 and 6.0 lb/A, (7) ATA at 0.5, 1.0, 1.5 and 2.0 lb/A, (8) sodium trichloropropionate at 0.5, 1.0, 1.5 and 2.0 lb/A, and (9) DB granular at 0.5, 1.0, 2.0 and 3.0 lb/sq rod. The hoary alyssum was either in the rosette stage or just beginning to shoot the stalk, while the red clover was 2-4 inches high. Duplicate square rod plots were used for each treatment level and all plots were randomized within the experimental area. Square yard quadrats were staked out in each plot and, at the time of evaluation, July 31, the green weights of hoary alyssum and red clover from each plot were taken. Results: Control (100%) resulted from (1) and (4) at 0.5 lb rate and (5) at 1.5 lb rate, without any reduction in red clover stand. Control of 84%, or better, without injury to red clover resulted from (2) and (3) at 0.5 lb rate. Good control but severe crop injury resulted from (6), (7), (8) and (9). (Contribution of Minnesota Department of Agriculture, and the Department of Agronomy and Plant Genetics, Institute of Agriculture,

University of Minnesota, St. Paul 1, Minn. Paper No. 3664, Scientific Journal Series, Minn. Agricultural Experiment Station)

Comparison of various chemicals for control of white cockle (Lychnis alba) in red clover. Blanchard, K. L. and Dunham, R. S. A heavy and uniform infestation of white cockle in a 2-year old red clover field near Bagley, Minnesota, was treated June 29, 1955 with (1) 2,4-D butoxy-ethanol ester LV, (2) 2,4-D isopropyl ester, (3) emulsified 2,4-D acid, (4) 4-chloro ester, (5) 2,4-D amine, (6) MCP ester, (7) MCP amine, (8) 2,4,5-T ester, (9) 2,4,5-TP, (10) 2,4,5-TP butoxyethanol ester, (11) 2,4-DP ester, (12) sodium trichloropropionate, (13) CDT, all at rates of 1.0, 2.0 and 3.0 lb/A, and (14) ATA at 2.0, 4.0 and 6.0 lb/A. Incidental primary species also growing uniformly over the experimental area were hoary alyssum and sweet clover. On August 17 the results of the treatments were as follows: (a) All formulations, with the exception of the CDT showed poor to fair control of white cockle and caused severe damage to red clover (80-100%). (b) CDT was comparatively outstanding in the control of white cockle (70-80%) and caused relatively little damage to the red clover (20-30%). (c) Treatments (1), (3), (4), (6) and (8) at the 2.0 and 3.0 lb levels all delayed maturity of white cockle by 2-3 weeks. (d) Poor control of hoary alyssum was noted with treatments (4), (12) and (13). (e) No sweet clover injury was noted on the plots treated with the 4-chloro ester. (Contribution of Minnesota Department of Agriculture and the Department of Agronomy and Plant Genetics, Institute of Agriculture, University of Minnesota, St. Paul, Minn. Paper No. 3671, Scientific Journal Series, Minn. Agricultural Experiment Station)

Comparative effects of various herbicides for control of white cockle (Lychnis alba) in red clover. Blanchard, K. L. and Dunham, R. S. A uniform and heavy infestation of white cockle, growing in a field of medium red clover near Bagley, Minnesota, was treated on June 13, 1956, with (1) CDT at 1.0, 2.0, 4.0, and 8 lb/A, (2) CMU at 0.5, 1.0, 2.0 and 3.0 lb/A, (3) ATA at 0.5, 0.75, 1.0 and 1.25 lb/A, (4) polychlorobenzoic acid at 1.0, 2.0, 4.0 and 6.0 lb/A, (5) 2,4-D butyric, (6) MCP butyric, (7) 2,4-D acetamide, and (8) 2,4,5-T acetamide, all at 0.5, 1.0, 2.0 and 3.0 lb/A. Duplicate square rod plots were used for each treatment level and all plots were randomized within the experimental area. Results (July 18): (1) at 4.0 lb--100% reduction in stand, (4) at 6.0 lb--80%, (8) at 3.0 lb--80%. All other treatments gave unsatisfactory reduction of stand. Observations on the effect of the herbicides on red clover could not be made because of excessive damage to red clover by grasshoppers. (Contribution of Minnesota Department of Agriculture and Department of Agronomy and Plant Genetics, Institute of Agriculture, University of Minnesota, St. Paul, Minn. Paper No. 3672, Scientific Journal Series, Minn. Agricultural Experiment Station)

Effect of various herbicides on Kochia (Kochia scoparia). Blanchard, K. L. and Dunham, R. S. A heavy infestation of kochia growing on crop land near Foxhome, Minnesota, was treated June 11, 1956, with (1) MCP amine, (2) 2,4-D LV ester, (3) 2,4-D amine, (4) ATA, (5) CDT and (6) polychlorobenzoic acid, all at the rates of 0.5, 1.0 and 1.5 lb/A. Duplicate square rod plots were used for each treatment level, and all plots were randomized within the experimental area. Plants were 2-4 inches tall at time of treatment. The period from time of treatment to time of evaluation was one of slightly above normal rainfall, with temperatures ranging mostly 5° below normal. On August 10 the results of these treatments were as follows: Good control resulted from (1) and (4) at 1.5 lb and (2), (5) and (6) at 1.0 lb. (Contribution of Minnesota Department of Agriculture, and the Department of Agronomy and Plant Genetics, Institute of Agriculture, University of Minnesota, St. Paul, Minn. Paper No. 3673, Scientific Journal Series, Minn. Agricultural Experiment Station)

Effect of various herbicides on corn spurry (Spergula arvensis). Blanchard, K. L. and Dunham, R. S. A heavy infestation of corn spurry and quack grass on fallow land near Warba, Minnesota, was treated June 6, 1956, with (1) amino triazole at 0.5, 0.75, 1.0 and 1.25 lb/A, (2) CMU at 0.5, 1.0, 1.5 and 2.0 lb/A, (3) CDT at 1.0, 2.0, 4.0 and 8.0 lb/A, (4) polychlorobenzoic acid at 1.0, 2.0, 4.0 and 6.0 lb/A, (5) 2,4-D butyric, (6) MCP butyric, (7) 2,4-D acetamide, and (8) 2,4,5-T acetamide, all at 0.5, 1.0, 2.0 and 3.0 lb/A. This weed at time of treatment was 1-3 inches high. Duplicate square rod plots were used for each treatment level and all plots were randomized within the experimental area. Results (July 13): 100% control resulted from (2) at 1.5 lb, (3) at 4.0 lb, (4) at 6.0 lb; 85-95% control resulted from (7) at 3.0 lb and (8) at 3.0 lb. (Contribution of Minnesota Department of Agriculture and the Department of Agronomy and Plant Genetics, Institute of Agriculture, University of Minnesota, St. Paul, Minn. Paper No. 3660, Scientific Journal Series, Minn. Agricultural Experiment Station)

Herbicidal control of wild buckwheat (Polygonum convolvulus). Brown, D. A. A uniform stand of this weed was obtained by drilling seed in rows. Treatments were applied in a spray of 10 gal. water per acre at two stages of growth, i.e.:-- (1) early seedling (2) late seedling plants 5 to 6 inches and tendrils showing. Results:

Treatment per acre	Percentage kill early stage	Percentage kill late stage
2,4-D butyl ester 8 oz.	36.5	30.75
2,4-D butyl ester 12 oz.	46.5	26.25
2,4-D 1V. butyl ethyl ester 8 oz.	40.0	32.0
2,4-D 1V. butyl ethyl ester 12 oz.	48.25	29.5
2,4-D 1V. butyl ethyl ester 8 oz.	32.0	25.5
2,4-D 1V. butyl ethyl ester 12 oz.	50.0	32.0
2,4-D butyl ester 4 oz. + amizol 2 oz.	23.5	25.0
2,4-D butyl ester 8 oz. + amizol 12 oz.	32.0	34.5
2,4-D butyl ester (2 sprayings) 8 oz.	62.5	48.75
2,4-D butyl ester (2 sprayings) 12 oz.	58.75	45.75
2,4-D 1V. butyl ethyl ester (2 sprayings) 8 oz.	62.5	39.75
2,4-D 1V. butyl ethyl ester (2 sprayings) 12 oz.	76.25	45.25
Average	47.4	34.6

Half the twice sprayed plots were given the first application at the early stage the other half not until the late stage. Twice sprayed plots showed 63 and 40 % control, respectively at early and late stages (8 oz/A) and 68 and 46% at the 12 oz. rate. This compared with 38 and 31; 47 and 28 at the single dosage and at 8 and 12 oz/A, respectively. (Experimental Farm, Brandon, Man.)

Herbicidal control of wild buckwheat in a crop of wheat. Brown, D. A. Treatments were made at two stages of growth, i.e.:--(1) wheat 6 inches high and buckwheat in three-leaf seedling stage, and (2) wheat 12 inches and buckwheat five-leaf early tendril stage.

Results:

Treatment per acre	Percentage control of wild buckwheat 1st stage	2nd stage	Yield of wheat bu/acre 1st stage	2nd stage
2,4-D butyl ester 8 oz.	49.0	57.5	61.6	55.6
2,4-D butyl ester 12 oz.	76.25	62.5	62.8	54.9
2,4-D butyl ethyl ester 8 oz.	71.25	65.25	57.7	54.4
2,4-D butyl ethyl ester 12 oz.	77.0	69.25	56.5	54.4
2,4-D lV. butoxyethanol ester 8 oz.	66.5	56.25	60.1	56.1
2,4-D butyl ester 4 oz. Amizol 2 oz.	57.5	50.0	38.1	19.0
2,4-D butyl ester 8 oz. Amizol 2 oz.	58.75	60.0	34.4	22.2
2,4-D b. ester 8 oz. (2 applications)	82.5	67.5	58.5	50.1
2,4-D b. ester 12 oz. (2 applications)	80.0	72.5	51.7	48.2
2,4-D lV. butoxyethanol ester 8 oz. (2 applications)	83.25	71.25	60.1	47.2
2,4-D butoxyethanol ester 12 oz. (2 applications)	90.0	80.75	52.0	43.6
Hand weeding	87.5	82.5	52.7	55.1
Check (no treatment)	-	-	55.1	

Significantly better control was obtained at the early seedling stage. Wheat yields were well sustained by all 2,4-D treatments except on the double applications at the 12 inch stage. Amizol severely injured the wheat but was relatively in effect against the wild buckwheat. (Experimental Farm, Brandon, Man.)

Control of wild buckwheat. Pre-plant treatments for barley. Brown, D. A. Treatments were made to a plot area known to be heavily infested with wild buckwheat. Barley was seeded three weeks after the chemicals were worked into the surface soil.

Treatment per acre	Control wild buckwheat %	Stand barley %	Yield barley bu/A
CIPC 10 lb	69.3	65.0	27.7
CIPC 10 lb + 6 lb 2,4-D b. ethyl ester	80.0	58.5	28.2
CDAA 8 lb	27.5	76.2	35.6
CDAA 8 lb + 6 lb 2,4-D b. ethyl ester	65.5	73.8	40.8
CMU 2 lb	40.0	70.0	27.9
CMU 2 lb + 6 lb 2,4-D b. ethyl ester	80.0	72.5	38.5
Amino triazole 6 oz.	24.0	67.5	30.1
Amino triazole 6 oz. + 6 lb 2,4-D b. ethyl ester	55.3	77.5	39.8
Check (no treatment)		84.0	33.9

Both wild buckwheat and red root pigweed were prevalent. Treatments appeared more effective for wild buckwheat than for pigweed. On plots where barley was thin as a result of treatment the pigweed flourished and did much to reduce the yield. Both weeds were thick in the check plots and undoubtedly depressed the yield. The 2,4-D

butyl ethyl ester appeared to give the best results because each of the other herbicides alone gave relatively poor kills of the weed with the exception of CIPC which in addition damaged the barley crop more than did other treatments. It is significant that in all cases the addition of 2,4-D butyl ethyl ester to the other herbicides gave higher yields and slightly better stands of barley in every instance compared with the chemicals used alone. Better weed kill was perhaps the main reason for this. (Experimental Farm, Brandon, Man.)

The selective control of scentless mayweed in a grass stand. Carder, A. C. On June 8, 1956, different chemicals were applied to a relatively heavy infestation of scentless mayweed, *Matricaria inodora*, in a creeping red fescue pasture. The chemicals were applied by hand-boom sprayer using an aqueous solution at 60 gal/A. One month later, a similar series of plots were laid out on a contiguous area and the same rates of the chemicals applied. The effects of the different treatments on the mayweed and fescue were appraised one month after treatment. Procedure and results are described in the table.

		Percentage suppression* of top growth			
	Active ingredient	Treated when mayweed 2-4 in. high		Treated when mayweed 10-12 in. high	
Herbicide	lb/A	Mayweed	Fescue	Mayweed	Fescue
2,4-D (butyl ester)	4	60#	15	35	5
	6	78	18	42	10
	8	80	20	48	10
2,3,6-TBA	4	58	22	28	10
	6	65	28	28	10
	8	72	30	30	10
CMU (monuron)	4	68	70	22	15
	6	85	78	30	22
	8	95	82	45	20
ATA	2	58	55	25	42
	4	68	70	25	50
	6	80	82	40	55
Ammate (ammonium sulphamate)	20	25	15	22	10
	30	40	18	22	10
	40	40	22	28	12

* Arbitrary units.
\# Av. of duplicate plots.

The data indicate that: 1) Best selectivity was obtained by the use of 2,4-D. At 6 lb/A this chemical considerably suppressed the mayweed and only slightly injured the fescue. 2) The next most selective chemical was 2,3,6-TBA. This herbicide chiefly affected the mayweed so that no viable seed was formed even at the lowest rate of 4 lb/A. 3) CMU at 8 lb/A virtually destroyed the mayweed but caused an almost equal degree of injury to the grass. Its action, therefore, is not selective. 4) The chemicals ATA and Ammate also proved non-selective. The latter did not strongly suppress the growth of the mayweed at the rates used. 5) Application of the chemicals when the mayweed was 2-4 in. in height gave better control than when they were applied at the more advanced growth stage of the weed. Examination

of the plots in the autumn showed a higher degree of selectivity with 2,4-D and 2,3,6-TBA than the above data indicate. By this time the fescue had recovered from the effects of these herbicides, while the mayweed had not. (Contribution of Experimental Farm, Beaverlodge, Alberta)

Control of cocklebur (Xanthium spp.) with 2,4-D and MCP. Duncan, D. A. Four chemicals, namely 2,4-D butyl ester (butoxyethanol ester of 2,4-D); 2,4-DB (4-(2-4-dichlorophenoxy) butyric acid; MCP (butoxyethanol ester of 2-methyl-4-chlorophenoxyacetic acid), and MCPB (4-(2-methyl-4-chlorophenoxy) butyric acid) were each applied by means of a Jari power sprayer at 4 and 8 oz./A to cocklebur in its second leaf stage growing in a crop of Selkirk wheat, thirty-five days after the crop was seeded. At the 4 oz./A rate, the two 2,4-D formulations had a slightly greater herbicidal effect than the two MCP formulations, but at the higher 8 oz./A rate both chemicals gave similar and highly effective kills. Cocklebur can be successfully controlled by using either 2,4-D or MCP at 4 to 8 oz./A. (Contributed by Division of Illustration Stations, Experimental Farm, Brandon, Man.)

Control of wild mustard in rapeseed with 2,4-D and MCP. Durksen, D. and Friesen, George. Since several farmers in Manitoba have claimed partial or complete success in controlling wild mustard in a crop of rapeseed, such an experiment was tried. A commercial field of rapeseed (Argentina variety), near Teulon, Manitoba, heavily infested with wild mustard, was selected. The following treatments were made on July 11 when both wild mustard and rapeseed were in bloom: amine salt of MCPA, 1 and 2 oz/A; sodium salt of MCPA, 2 and 4 oz/A; amine salt of 2,4-D, 1, 2 and 3 oz/A. An ordinary farm sprayer delivering 5 gal/A total volume was used. The results were not encouraging. The amine salt of MCPA at both rates seriously damaged the rapeseed and did not give complete control of wild mustard. Both rates of sodium salt of MCPA gave only slight control of wild mustard but damaged the rapeseed. The amine salt of 2,4-D gave increased damage to both species with increased rates. Recovery of both species at harvest time was good. The unsatisfactory results were probably due to the advanced stage of both crop and weed. Possibly a higher volume of water would tend to increase selectivity. (Contribution from Soils and Crops Branch, Manitoba Department of Agriculture and The University of Manitoba, Winnipeg)

Comparison of butyrics in wild buckwheat control. Forsberg, D. E. In the spring of 1956 a four-replicated test of Chinook wheat was sprayed with MCPBNA, 2,4-DBNA, MCPBA and 2,4-DBA at 4, 6 and 8 oz acid equivalent/A. These herbicides were sprayed during the two and four leaf stages of wheat. Also included in this test were MCPE 5 oz acid equivalent/A plus one week later 5 oz acid equivalent/A of 2,4-DE, and 5 oz acid equivalent/A of MCPE plus one week later 5 oz acid equivalent/A of LV-4. Results: Butyric forms of the herbicide did not control wild buckwheat. Later sprayings resulted in susceptible weeds not being killed and consequently yields of grain were low. Double applications of MCPE, 2,4-DE and LV-4 gave good weed control with increases of grain yield as high as 15.1 bu/A over the check plots. (Contribution from Experimental Farm, Scott, Sask.)

Effect of herbicides on wild buckwheat. Forsberg, D. E. In 1956 esters of 2,4-D and LV-4 were sprayed on wild buckwheat at 5 oz acid equivalent/A and in two 5 oz applications, which were spaced one, two and three weeks apart. Initial applications for buckwheat were in the 2nd, 4th and 6th leaf stage. Also included were 2,4-DEB and MCPEB at 4, 8, 16 and 32 oz acid equivalent/A. Also these two chemicals were applied in two 5 oz applications spaced one week apart, and in the 2nd leaf stage of buckwheat. This test was conducted on Chinook wheat and Ajax oats using a 4-replicated randomized block design. Results: Best results were

obtained with the two 5 oz applications of 2,4-DE applied when the buckwheat was in the 2-leaf stage and by spacing the applications one week apart. This treatment gave a 13.8 bu. increase of wheat over the check plot and a 96% reduction in wild buckwheat. A single 5 oz application of 2,4-DE applied at this early date gave a 92% reduction in wild buckwheat and a 12.6 bu. increase of wheat over the check. Spraying buckwheat in the 4 and 6 leaf stage did not control buckwheat as well, and annual weeds such as stink weed, reached the resistant stage and lowered crop yields. LV-4 gave equal control of wild buckwheat; however, the effect on crop yields was more severe. MCPEB and 2,4-DEB were not too effective in controlling wild buckwheat even at the high ratio used. In the oat crop the buckwheat control was similar to the control in the wheat crop. However, the yields of oats were reduced considerably. Two applications of 2,4-DE at 5 oz gave a yield of 50.5 bu/A as compared to the check yield of 50.3 bu/A. (Contribution from Experimental Farm, Scott, Sask.)

<u>Effect of a combination of herbicides on wild buckwheat.</u> Forsberg, D. E. Esters of 2,4-D, MCP and LV-4 were sprayed on Chinook wheat at 4, 5, 6 and 8 oz acid equivalent/A and in combination with one oz acid equivalent/A of ATA and 2 oz acid equivalent/A of Dow-pre-emergence. Spraying was done when the grain was in the three leaf stage and when the wild buckwheat was in the four leaf stage. <u>Results:</u> The addition of ATA and Dow pre-emergence did not control wild buckwheat any better than did the straight esters of 2,4-D, LV-4 and MCP. However the yields of grain were very good on this test. (Contribution from Experimental Farm, Scott, Sask.)

<u>Effect of pre-emergence sprays on wild buckwheat.</u> Forsberg, D. E. In the spring of 1956 a four replicated test was laid out and sprayed one week after seeding Chinook wheat. The following rates and herbicides were used; 2,4-DE, LV-4 and ATA at 2, 4 and 6 lb acid equivalent/A. The above rates of 2,4-DE and LV-4 were also used in combination with ATA at 2, 4 and 6 oz acid equivalent/A. <u>Results:</u> Throughout the summer all treatments, with the exception of ATA when used alone, gave excellent weed control. Analysis of variance showed no significant difference in wheat yields from treatments in this test. Whenever the 4 and 6 lb rates of 2,4-D and LV-4 were used, deformities were noted in the grain crop. From results in the last two years it appears that rates lower than two lb can be used with satisfaction. (Contribution from Experimental Farm, Scott, Sask.)

<u>Cultural control of wild buckwheat.</u> Forsberg, D. E. Tests have been conducted at the Experimental Farm, Scott, Sask., for the past 10 years on methods of preparing summerfallow before seeding cereal crops. During the summer of 1956, counts were made on the wild buckwheat population, and the results are presented in the table:

	Yield in bu/A.1956			Yield in bu/A. 9 yr av.	10 year av.		No of wild
Treatment	Wheat	Oats	Barley	Wheat	Oats	Barley	buckwheat/sq ft
Allow weeds to start. Seed with one-way & pack.	22.8	38.1	20.3	14.6	33.9	20.7	15.8
Early spring seed with one-way & pack.	20.0	31.6	17.0	12.9	28.7	19.2	46.4
Early spring cult. ten days later seed with one-way & pack.	19.1	36.4	16.0	14.2	33.2	19.9	14.9

Table (continued)

Treatment	Yield in bu/A.1956 Wheat	Oats	Barley	Yield in bu/A. 9 yr av. Wheat	10 yr av. Oats	Barley	No of wild buckwheat/sq ft
Allow weeds to start cult. if weedy and seed with drill	19.4	36.0	21.8	12.6	32.8	19.3	16.1
Early spring cult. ten days later cult. if weedy and seed with drill	21.5	41.7	19.2	15.0	37.5	22.6	18.6
Allow weeds to start. Cult. ten days later seed with one-way & pack	21.4	40.0	21.0	12.5	34.8	18.8	2.4
Allow weeds to start. Cult. ten days later cult. if weedy and seed with drill	23.4	46.0	23.9	12.9	35.2	21.3	3.8
Early spring cult. and seed with drill	13.8	31.0	17.2	11.8	29.1	18.1	50.6
LSD (5% level)	2.7	5.8	4.1				

Thus wild buckwheat can be controlled satisfactorily by a delayed seeding method, i.e., by killing one or two crops of wild buckwheat before seeding the cereal crop. (Contribution from Experimental Farm, Scott, Sask.)

Effect of double applications of MCP butyl ester on wild buckwheat. Forsberg, D. E. In 1956 two applications of MCP butyl ester were applied to wild buckwheat in stands of Chinook wheat, Ajax oats and Velvon barley with 5 oz of acid equivalent/A at each application. Spraying was done when the buckwheat was in the 2 and 3 true leaf stage and when the grain was in the first and 2nd leaf stage. Applications of MCP were spaced one week apart. Results:

Method of seeding on summerfallow	Wheat bu/A. Spray	No Spray	Oats bu/A. Spray	No Spray	Barley bu/A Spray	No Spray	Buckwheat/sq ft Before spray	After spray	% Weed kill
Early spring cult. and seeding with drill	11.2	8.8	27.0	17.4	15.3	7.8	50.6	7.8	87
Early spring seed with one-way & pack	15.6	10.3	21.7	14.7	18.2	8.9	46.4	3.5	92

Although a complete kill of wild buckwheat was not obtained, the plants remaining were retarded sufficiently to interfere with harvesting operations. (Contribution from Experimental Farm, Scott, Sask.)

Effect of 2,4-DE on wild buckwheat when sprayed at different times. Forsberg, D. E. During the evening of June 27 a mixed weed population of stinkweed, wild buckwheat, Russian thistle and Russian pigweed were top sprayed with 2,4-DE at 5 oz acid equivalent/A. Spraying was continued throughout the evening with the first spray starting at 8 P.M. and then spraying every hour until 7 A.M. in the morning. Stinkweed was in the flowering stage and the wild buckwheat was in the 6-leaf stage. Results: One hundred per cent kill on all weeds was obtained when spraying was done from 6 to 7 o'clock in the morning. Good weed control was observed from 4 o'clock in the morning and up to 7 o'clock. At this time the sun was up and the heavy dew which formed during the night started to evaporate. Virtually no weed kill was obtained from 8 o'clock in the evening until 3 o'clock in the morning as weeds treated in this test were getting into the resistant stage. (Contribution from Experimental Farm, Scott, Sask.)

Effect of 2,4-DE, LV-4 and MCPE on wild buckwheat when sprayed at an early stage on grain. Forsberg, D. E. In 1956, 2,4-DE, LV-4 and MCPE, in a four-replicated test, were sprayed on wild buckwheat in Chinook wheat, at 5, 8, 12 and 16 oz of acid equivalent/A, and also at two 5 oz applications sprayed one week apart. The buckwheat was sprayed during the first and second true leaf stage and when the grain was in the first and second true leaf stage. Results: Good control of buckwheat was obtained with the 8, 12, 16 and the two 5 oz applications of all herbicides used. The highest percentage of buckwheat kill was obtained with the double applications, giving 100% kill with LV-4 and 2,4-DE and 96% kill with MCPE. To get comparable kills with single applications, rates as high as 12 and 16 oz acid equivalent/A would have to be used. Although an analysis of variance showed no significant difference between the yields of treatments, two 5 oz applications of MCPE gave the highest yield. This treatment yielded 2.4 bu/A more than the check. The two applications of 2,4-DE and LV-4 ester yielded 0.5 and 1.3 bu/A less than the check, respectively. Reductions in yields were also encountered with the 8, 12 and 16 oz rates of 2,4-D and LV-4. Numerous deformities were encountered with 8, 12 and 16 oz of 2,4-DE and LV-4 while only the 12 and 16 oz rates showed some deformities with MCPE. (Contribution from Experimental Farm, Scott, Sask.)

Comparison of single and repeated dosages of phenoxy-type herbicides for the control of tartary buckwheat. Friesen, H. A. MCP butyl ester, 2,4-D butyl ester, propylene glycol butyl ether ester and butoxy ethanol ester each at 4 and 8 oz/A. were sprayed on tartary buckwheat, Fagopyrum tataricum, in Olli barley. The latter two were also applied at the 12 oz/A rate. The first spraying was done on June 8 when the buckwheat was in the 2-leaf stage and the barley was in the 3-4 leaf stage. A portion of each treated strip was retreated with butyl ester of MCP and the butyl and butoxy ethanol esters of 2,4-D, each at 4 oz/A. on June 26, 18 days later. Results: Plant counts taken in August showed that each of the herbicide treatments had resulted in only a small reduction in the stand of buckwheat. MCP, 2,4-D, the butoxy ethanol ester and the propylene glycol butyl ether ester of 2,4-D each at 8 oz/A. killed 15, 20, 20 and 20 per cent of the plants, respectively. The surviving plants were very much stunted but produced some viable seed. Suppression of growth was noticeably better following the low volatile esters of 2,4-D. The 12 oz/A. rate of 2,4-D appeared little better than the 8 oz/A. rate. The 12 oz/A. of the butoxy ethanol ester was noticeably better than the 8 oz/A. of this herbicide and resulted in 40% of the plants being killed. The 4 oz/A. rate of all herbicides failed to kill any plants but did result in marked suppression of growth. The retreatment made 18 days later was largely ineffective. Due to the variability in the stand of both barley and buckwheat the weed weights and barley yields were of no value. (Contributed by the Experimental Farm, Lacombe, Alta)

Comparison of various herbicides for the control of corn spurry (Spergula arvensis). Friesen, H. A. and Walker, D. R. MCPA butyl ester, 2,4-D butyl ester and propylene glycol butyl ether ester at dosages of 4, 8 and 12 oz/A. were applied to corn spurry in wheat. Other herbicides applied were MCPB sodium salt at 24 oz/A., polychlorobenzoic acid at 8 and 16 lb/A. and mixtures of 2,4-D butyl ester and CMU in the ratios of 4 oz/A. 2,4-D:1/2 lb/A. CMU; 4 oz/A. 2,4-D: 1 lb/A. CMU and 4 oz/A. 2,4-D:2 lb/A CMU. Emergence and development of the corn spurry and wheat were highly variable, the former was mostly in an advanced seedling stage while the crop was for the most part in the 4-leaf stage at the time of spraying on June 12, 1956. The spurry infestation, while variable was very heavy, many of the plots also had a moderately heavy infestation of hemp nettle, Galeopsis tetrahit. On June 28, 16 days later, portions of each plot were retreated with MCPA ester, 2,4-D ester and Tenten at 4 oz/A. Results: MCPA ester and MCPB sodium had no noticeable effect on the wheat or the corn spurry but where used dosages of 8 oz/A or higher resulted in excellent control of the hemp nettle. The butyl ester and the propylene glycol butyl ether ester of 2,4-D at the 8 and 12 oz/A. dosages noticeably suppressed the spurry, but the degree of control was not satisfactory. Repeat spraying on June 28 did not materially improve the effectiveness of the herbicides. Polychlorobenzoic acid suppressed the crop but did not control the weed. The 4 oz/A. rate of 2,4-D mixed with 2 lb/A. CMU resulted in complete kills of both the spurry and the nettle but thinned the stand of wheat by 40%. When the mixture contained 1 lb/A. of CMU, it killed 80% of the spurry, 10% of the wheat and suppressed the nettle. When the mixture contained 1/2 lb/A. CMU only slight suppression in the growth of the crop and the weeds was noted. (Contributed by the Experimental Farm, Lacombe, Alta.)

Reaction of various annual weeds to 1-n-butyl-3-(3,4-dichlorophenyl)-1-methylurea (neburon). Friesen, H. A. and Walker, D. R. Neburon at 10.8, 7.2, 5.4, 3.6 and 1.8 lb/A. active ingredient was applied to tartary buckwheat, Fagopyrum tataricum, in barley, to corn spurry, Spergula arvensis, in wheat and to white cockle, Lychnis alba, in a one-year old stand of brome-alfalfa. The herbicide was applied with a knapsack sprayer with water used as a diluent at the rate of 100 gal/A. Results: The tartary buckwheat was sprayed at two growth stages, viz: cotyledon and early flower. At both stages the neburon resulted in complete removal of the buckwheat if applied at rates of 5.4 lb/A. or higher. The 3.6 lb/A. rate killed over 50% of the plants and very markedly suppressed the survivors. The barley was not visibly affected by any of the treatments. Due to non-uniform stands yields were not taken. The corn spurry was treated at only one stage namely seedlings about 3 inches tall. Each rate of neburon resulted in complete killing of the corn spurry plants. Hemp nettle plants (Galeopsis tetrahit) were killed by the two heavy rates; the 3.6 lb/A. rate killed 65% of the nettle plants, and the 1.8 lb/A. rate had no effect. The stand of White Dutch clover, volunteering on these plots, was reduced by 60, 85, 95 and 100% by the 1.8, 3.6, 7.2 and 10.8 lb/A. rates, respectively. The wheat was noticeably stunted and tillering was reduced by the two heavier dosages. White cockle suffered no apparent injury following treatment with neburon at any of the above rates. The cockle was mostly in the early bud stage at the time of treatment. The brome grass showed no effect from treatment, some stunting was observed in alfalfa following the higher rates. (Contributed by the Experimental Farm, Lacombe Alta.)

Effect of herbicides on wild buckwheat (Polygonum convolvulus). Keys, C. H. A buckwheat infested area at Loverna, Sask., was sown to wheat and then divided into 48 plots 10 ft x 18 ft in size. All treatments were quadruplicated and randomized. Two,4-D butyl ester, LV-4 ester and MCP ester were each applied at 5 oz/A. and 8 oz/A. singly. Duplicate applications of each chemical were made at

1 week and 2 week intervals using the 5 oz/A. rate. Spraying was begun on June 12 when the wheat was in the five leaf stage and the buckwheat had from 2-4 true leaves. Growing conditions were slow due to dry weather and had not improved much by June 19 when the second application of the "1 week interval" treatment was made. By June 26, when the "2 week interval" application was made, more than three inches of rain had fallen and growth was rapid. Weed scores, crop yield and weed seed yields were taken to obtain measurements of control. Evidence from weed scores indicated that control ranged from 15-35%. The treatments providing the best control were double applications of either 2,4-D or LV-4 at two week intervals. Under the conditions that prevailed the double applications, one week apart, were very little better than single applications. Weed seed yields provided much the same control pattern as did weed scores. Grain yields were relatively uniform and provided no leads insofar as weed control was concerned. There was no evidence of crop damage due to the treatments. (Contribution from Experimental Farm, Scott, Sask.)

Effect of chemicals on scentless chamomile. Molberg, E. S. A number of chemicals were applied to scentless chamomile (Matricaria inodora) on June 14, 1956. Applications were made when the weeds were about 4 in. high. The plots were 8 ft by 90 ft and the treatments were not replicated. ATA was the most effective, and gave 100% control at both 8 and 16 lb/A. applications. A borate-monuron mixture (Ureabor) at 60 lb/A. gave 90% control, and 2,3,6-T BA at 8 and 16 lb/A. gave 50% and 95% control respectively. Ammonium sulphamate and DB granular at $1\frac{1}{2}$ lb/100 sq ft gave 75% and 50% control, respectively. A butyl ester of 2,4-D at 2 lb/A. gave 60% control where there was grass competition, but only 20% control where there was no grass. The other chemicals tried, which were all unsatisfactory were various formulations of 2,4-D, MCP, and 2,4,5-T at 1 and 2 lb/A., chlorea at 60 lb/A., and anhydrous borax (concentrated borescu) at $1\frac{1}{2}$ lb/100 sq ft; 30 lb/A. rates of ureabor and ammonium sulphamate were also unsatisfactory. (Contributed by the Dominion Experimental Farm, Regina, Sask.)

Effect of time of spraying 2,4-D on wild buckwheat. Molberg, E. S. Plots of wild buckwheat (Polygonum convolvulus growing in wheat were sprayed at three different times of the day with a butyl ester of 2,4-D at 6 oz/A. Plots were 13 ft by 200 ft and not replicated. There were an average of 3 to 4 weeds per sq yard, which were 1.5 in. high and in the 4 leaf stage at the dates of spraying June 8 and 9. The times of spraying were (1) at dusk, 9:30 P.M. (2) after dark, 12:15 A.M. and (3) in bright sunlight, 7:30 A.M. None of the treatments gave satisfactory control, but best results were obtained from the spraying done at dusk. The number of wild buckwheat in 20 sq yards and the average height in inches of the weeds (shown in brackets) were as follows for the different times of treatment. Dusk -27 (10.8); Dark -43 (17.8); Sunlight -40 (12.5); Check 63 (22.3). (Contributed by the Dominion Experimental Farm, Regina, Sask.)

Relative effect of 2,4-D and amino triazole on annual weeds, 1956. Selleck, G. W. and Coupland, R. T. Ten species of annual weeds (which had been seeded in rows 2 ft apart in October, 1955) were treated at Saskatoon with a mixed ester and alkanolamine of 2,4-D at $\frac{1}{2}$ lb/A., butoxy ethanol ester at $\frac{1}{4}$, $\frac{1}{2}$ and 1 lb/A. and amino triazole at $\frac{1}{2}$, 1, 2 and 4 lb acid equivalent/A. in 8.3 Imp. gal of water. Triplicated treatments were made on June 26 and July 16. The table below indicates relative percentage control obtained (0 = no effect, 60 = satisfactory control, 100 = complete killing) in the most susceptible (earliest) stage of treatment based on visual examinations made in July and August. The average of the rates of amino triazole and low volatile ester of 2,4-D are compared with the application of the ester and amine of 2,4-D applied at $\frac{1}{2}$ lb/A.

Species	Herbicide 2,4-D ester	2,4-D amine	2,4-D low volatile	Amino triazole
Stinkweed	85	80	93	55
Russian pigweed	80	85	83	60
Russian thistle	70	51	73	11
Cow cockle	64	20	55	47
Red-root pigweed	60	10	40	26
Blue bur	51	35	71	25
Green foxtail	20	15	10	79
Wild buckwheat	20	10	20	-
Darnel	0	10	0	17
Purslane	0	0	16	37

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation)

Relative effect of 4-(2,4-DB) and 4-(MCPB) in comparison with 2,4-D on annual weeds, 1956. Selleck, G. W. and Coupland, R. T. Ten species of annual weeds (which had been seeded in rows 2 ft apart October, 1955) were treated at Saskatoon with the ester of 2,4-D at 8 oz and the sodium salts of 4-(2,4-DB) (4-(2, 4-dichlorophenoxy) butyric acid) and 4(MCPB) (4-(2-methyl-4-chlorophenoxy) butyric acid) at 4, 8, 16 and 8, 16 and 32 oz/A., respectively, of acid equivalent in 8.3 Imp. gal of water. Triplicated treatments were made on June 26 and July 16. Visual examinations which were made in July and August indicated the relative percentage control to be as follows (0 = no effect, 60 = satisfactory control, 100 = complete killing) in the most susceptible stage of treatment on the average of the rates applied.

Species	Herbicide 2,4-D ester	Na salt 4(2,4-DB)	Na salt 4(MCPB)
Stinkweed	85	22	23
Russian pigweed	80	45	56
Russian thistle	70	21	14
Cow cockle	70	0	10
Red-root pigweed	60	0	14
Blue bur	51	16	15
Green foxtail	20	0	9
Wild buckwheat	20	13	0
Darnel	0	0	0
Purslane	0	0	0

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation)

Relative effect of formulations of MCP in comparison with 2,4-D on annual weeds, 1956. Selleck, G. W. and Coupland, R. T. Ten species of annual weeds (which had been seeded in rows 2 ft apart in October, 1955) were treated at Saskatoon with a mixed ester of 2,4-D at a rate of 8 oz and the amine and sodium-potassium salts of MCP at 8 and 16 oz acid equivalent/A. in 8.3 Imp. gal of water. Triplicated treatments were made on June 26 and July 16. Visual examination made

in July and in August indicated the relative percentage control to be as follows (0 = no effect, 60 = satisfactory control, 100 = complete killing) in the most susceptible stage of treatment determined from the average of the two rates applied.

	Herbicide		
Species	2,4-D ester	MCP Na-K salt	MCP amine
Stinkweed	85	52	31
Russian pigweed	80	90	-
Russian thistle	70	17	55
Cow cockle	64	23	40
Red-root pigweed	60	15	13
Blue bur	51	22	13
Green foxtail	20	0	10
Wild buckwheat	20	10	5
Darnel	0	0	0
Purslane	0	0	0

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation)

<u>Relative effect of Dalapon, TCA and 2,2,3-TPA in comparison with 2,4-D on annual weeds, 1956.</u> Selleck, G. W. and Coupland, R. T. Ten species of annual weeds (which had been seeded in rows 2 ft apart in October, 1955) were treated at Saskatoon with a mixed ester of 2,4-D at 8 oz and the sodium salts of Dalapon, TCA and 2,2,3-TPA (2,2-3 trichloropropionic acid) at 3, 6 and 12 lb acid equivalent/A. in 8.3 Imp. gal of water. Triplicated treatments were made on June 26 and July 16. Visual examinations which were made in July and in August indicated the relative percentage control to be as shown below (0 = no effect, 60 = satisfactory control, 100 = complete killing) in the most susceptible stage of treatment, on the average of the 3 rates applied. Two,2,3-TPA appeared to be more effective at the second date of application.

	Herbicide			
Species	2,4-D ester	Dalapon	TCA	2,2,3-TPA
Stinkweed	85	52	20	50
Russian pigweed	80	62	22	10
Russian thistle	70	15	5	20
Cow cockle	64	48	30	46
Red-root pigweed	60	43	15	36
Blue bur	51	19	14	20
Green foxtail	20	68	68	68
Wild buckwheat	20	36	12	35
Darnel	0	46	27	20
Purslane	0	9	0	0

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation)

<u>Relative effect of 2-(2,4,5-TP) in comparison with 2,4-D on annual weeds, 1956.</u> Selleck, G. W. and Coupland, R. T. Ten species of annual weeds (which

had been seeded in rows 2 ft apart in October, 1955) were treated at Saskatoon with a mixed ester of 2,4-D at 8 oz and the amine and butyl ester formulations of 2-(2, 4,5-TP) (2-(2,4,5-trichlorophenoxy) propionic acid) at 8 and 16 oz acid equivalent/A. in 8.3 Imp. gal of water. Triplicated treatments were made on June 26 and July 16. Visual examinations made in July and August indicated the relative percentage control to be as follows (0 = no effect, 60 = satisfactory control, 100 = complete killing) in the most susceptible stage determined from the average of the two rates applied.

	Herbicide		
Species	2,4-D ester	2,2(4,5-TP) ester	2,2(4,5-TP) amine
Stinkweed	85	63	47
Russian pigweed	80	-	92
Russian thistle	70	62	50
Cow cockle	70	43	26
Red-root pigweed	60	33	25
Blue bur	51	45	10
Green foxtail	20	8	5
Wild buckwheat	20	23	12
Darnel	0	20	0
Purslane	0	0	0

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation)

Post-emergence control of broad-leaf annuals in several crops. Sexsmith, J. J. Thirteen crops (potato, cucumber, carrot, table beet, sugar beet, canning pea, green bean, dry bean, commercial yellow mustard, flax, barley, wheat, and corn) were seeded on May 16, 1956, into a silty clay loam irrigated soil. The naturally-occurring heavy infestation of broad-leaf annual weeds consisted of red-root pigweed (Amaranthus retroflexus), lamb's quarters (Chenopodium album), and stinkweed (Thlaspi arvense), with the pigweed as the predominant species. Duplicate plots were treated on June 22 with the following materials at a solution rate of 21.2 gal/A: mixed sodium and potassium salt of MCP at 4 and 8 oz/A., sodium salt of 4-(MCPB) and the sodium salt of 4-(2,4-DB) at 8 and 16 oz/A.. Most crops were growing reasonably well; beets were in the 5-leaf stage, peas were 8 to 10 inches tall, beans 4 to 5 inches tall, mustard to 13 inches, flax 5 to 7 inches, and wheat was in the shot-blade stage. No cucumbers were growing on the plots. Red-root pigweed and lamb's quarters were in the vegetative stage to 4 or 5 inches tall, and stinkweed was in early bloom to first pod. Control estimates for the three weeds and notes on conditions of crops were taken 4 weeks after treatment. Results: A summary of weed control is given in the following table:

	Weed control - %					
	MCP Na-K salt		4-(MCPB)		4-(2,4-DB)	
	4 oz	8 oz	8 oz	16 oz	8 oz	16 oz
Red-root pigweed	0	0	0	0	0+	0+
Lamb's quarters	20	25	0+	25	35	50
Stinkweed	65	80	20	40	20	25

None of the materials gave any amount of control of the reasonably well-advanced

red-root pigweed. Slightly better control of stinkweed was obtained with 4-(MCPB) than for 4-(2,4-DB), but the latter gave considerably better control of lamb's quarters. MCP caused severe injury to carrots, table and sugar beets, and mustard, caused slight injury to potatoes and both types of beans, but had little or no visible effect on the other crops. Also 4-(MCPB) caused severe injury to table and sugar beets, slight injury to green beans, and little or no injury to other crops, while 4-(2,4-DB) caused severe injury to both kinds of beets, and moderate injury to potatoes and both types of beans. Moderate injury resulted to carrots from the 16 oz rate of 4-(2,4-DB), but the light rate had no damaging effects. Other crop species were relatively unaffected by 4-(2,4-DB). (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta)

Comparison of several herbicides for the control of Russian thistle (Salsola pestifer) in flax. Sexsmith, J. J. Redwood flax was seeded May 26, 1955 on silty clay loam at Lethbridge, Alberta, and was treated with several herbicides 36 days later when the flax was 6 to 7 inches tall, and Russian thistle in the very light and naturally-occurring infestation varied from the "pine-leaf" stage to a height of 5 inches with up to six branches. The following materials were used: butyl ester of 2,4-D at 2, 3, and 6 oz/A; dimethylamine of 2,4-D, mixed sodium-potassium salt of MCP, potassium salt of MCP, and butyl ester of MCP at 4, 8, and 12 oz/A.; and sodium salt of 4-(2,4-DB) and sodium salt of 4-(MCPB) at 8, 16, and 24 oz/A. A few days before starting harvest of the flax, control rating estimates were made, scoring from 0 to 10 indicating a range from no visible effect of treatment to complete kill. An estimate of the severity of maturity delay was also made. Neither yield data nor actual maturity data are available. Results: The Russian thistle control ratings, based on the average of 4 replicates, are presented below.

Rate	2,4-D ester	Rate	4-(2,4-DB) sodium	4-(MCPB) sodium
2 oz	0.9	8 oz	0.4	0.1
3 oz	3.1	16 oz	2.2	0.1
6 oz	5.5	24 oz	1.8	0.6

Rate	2,4-D amine	MCP Na-K mixt.	MCP potassium	MCP ester
4 oz	1.4	0.2	0.2	0.4
8 oz	3.8	0.2	0.4	0.4
12 oz	7.0	0.6	0.6	0.6

The ester and amine of 2,4-D gave some degree of Russian thistle control; the other materials were of no value. Based on notes only, fairly serious maturity delay resulted from treatments with the highest rate of the ester and the amine of 2,4-D, whereas only slight delays were noted for the highest rates of the other herbicides included in the test. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta)

Chemicals for control of Russian thistle (Salsola pestifer) in spring wheat. Sexsmith, J. J. Quadruplicate plots of Chinook spring wheat on silty clay loam at Lethbridge, Alberta, were treated with the following materials at the rates and growth stages specified: dimethylamine of 2,4-D and triethanolamine of MCP at 4, 8, and 16 oz/A., and sodium salt of 4-(MCPB) at 8, 16, and 24 oz/A., applied at the 2-leaf stage of wheat growth; double treatments with the dimethylamine of 2,4-D at 4, 8, and 16 oz/A. and the butyl ester of 2,4-D at 2, 4, and 8 oz/A., applied at the 3- and 5-leaf stages; dimethylamine of 2,4-D, triethanolamine of MCP, and a solubilized acid formulation of 2,4-D at 4,8, and 16 oz/A., butyl ester of 2,4-D at

2, 4, and 8 oz/A., and sodium salt of 4-(2,4-DB) at 8, 16, and 24 oz/A., applied at the 4-leaf stage. The natural infestation of Russian thistle was very light. Immediately prior to harvest, a control rating was estimated, the scoring from 0 to 10 indicating a range from no visible effect of treatment to complete kill. Results:

	Treatment at 2-leaf stage									Double treatment at 3- and 5-leaf stages					
Chemical	2,4-D amine			MCP amine			4-(MCPB)			MCP amine			2,4-D ester		
Rate oz/A.	4	8	16	4	8	16	8	16	24	4	8	16	2	4	8
Control	3+	4	4	0	1	2	0	0+	1	2	3	5+	7	9+	9+

	Treatment at 4-leaf stage														
Chemical	2,4-D amine			MCP amine			2,4-D ester			2,4-D acid			4-(2,4-DB)		
Rate oz/A.	4	8	16	4	8	16	2	4	8	4	8	16	8	16	24
Control	7	8	9	0	1	2	7	8	9	7	8+	10	3	4	4

Early treatments (2-leaf stage) with 4-(MCPB) caused no visible injury to the wheat, whereas all rates of the amines of 2,4-D and MCP caused some degree of injury of the types mentioned below. All double treatments at the medium and high rates caused a serious degree of injury including doubling of spikelets at the nodes, fusion of glumes and lemmas, clubbing of heads, and twisting and shortening of the tiller culms. With the exception of the 16 oz rate of the acid of 2,4-D, the treatments applied at the 4-leaf stage caused little or no crop injury. With one unexplainable exception, all rates of all treatments caused a decrease in the degree of lodging. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta)

Effects of methods of handling summerfallow land on weed control, crop residue, and moisture storage. Shafer, N. E. A large sweep Noble blade, double disc plus chisel, and no tillage were compared with the usual fallow method which included the use of a one-way, spring-tooth, chisel, and rod weeder. Square yard quadrats clipped on May 3 following the first tillage, showed the following air dry weights of standing straw in lb/A.: double disc 963, Noble blade 2043, one-way 473, and undisturbed 3801. Chemical treatments were made across all tillage plots except where usual fallow was used. Grass herbicides applied May 10 included Dalapon at 4, 5, and 6 lb/A.; Amizol at 1, 1.5, and 2 lb/A. and a Dalapon plus Amizol mixture at 4 lb and 1 lb/A., respectively. Broadleaf weeds were controlled by spraying May 23 and July 6 with 1/2 lb of 2,4-D ester each time. Also on July 6, two additional plots were added using a mixture containing 1/2 lb Amizol and 1 lb of Karmex W. Soil moisture samples were taken September 5. Results: All grass herbicides were most effective where the Noble blade had been used the previous September, and least effective where the stubble was left undisturbed. Where the land had been disced prior to herbicide treatment, chemical effectiveness was intermediate. Six weeks after treatment no seed heads or seedlings were present where the Noble blade was used in combination with any of the grass herbicides. On disced land numerous seedlings of downy brome were present in all chemical plots. In the undisturbed area seed heads of downy brome and volunteer wheat were plentiful in all of the chemical plots. The first 2,4-D treatments almost completely controlled Russian thistle, and kochia, until July 6 when a second treatment became necessary. On August 7, the Amizol-Karmex W combination was most effective in controlling kochia, Russian thistle, rough pigweed, lambsquarters and had apparently inhibited late germination of witchgrass (*Panicum capillare*) and stink

grass (Eragrostis cilianensis). Soil moisture had penetrated the greatest depth (more than 4 feet) under the Noble blade plus chemicals. Average moisture contents in the four foot profile showed no difference between the usual-tillage plus no chemicals and chemicals plus no tillage. There was dry soil at 3½ feet in both areas. The disc and chisel plus chemicals was intermediate. Moisture percentages for the various treatments in the fourth foot of soil were as follows: Noble blade plus chemicals 18.85; disc and chisel plus chemicals 15.76, undisturbed stubble plus chemicals 11.31, and usual fallow with no chemicals 10.10. (Contribution of Department of Agronomy, University of Nebraska, Lincoln, Nebraska)

Comparison of 2,4-D ester, MCP-ester, and LV 2,4-D-ester at various rates and in various combinations on tartary buckwheat and Olli barley. Vanden Born, Wm. and Corns, Wm. G. Plots containing both tartary buckwheat and barley, seeded in separate rows on May 18, were sprayed on June 7 with the esters of 2,4-D, MCP, and LV 2,4-D at 0, 4, 8, 10 oz/A. Buckwheat was in 3-leaf stage (true leaves), while barley was in 3-4 leaf stage (7 inches high). On June 19 (12 days later) a second application of chemical was made, including check, 2,4-D ester 4 oz/A., MCP ester 4 oz/A., LV 2,4-D ester 4 oz/A. The experiment was designed to give all possible combinations between the first and second treatments (48 combinations in all). On July 19, after seed set had begun, one row of tartary buckwheat was harvested, and green weight data were obtained. To determine seed yield of tartary buckwheat, another row was harvested on September 5. Barley yield data were obtained on August 15. In comparisons made on both green weight and seed yield data of tartary buckwheat, almost without exception the low-volatile ester of 2,4-D was better than the standard ester, and both were much superior to MCP-ester, except at the 16 oz/A. rate, where the differences were less marked. There appeared to be no advantage in using repeated applications at a lower rate rather than one application at a corresponding higher rate. With one exception, barley yields on all treated plots were greater than on the untreated plots. The increase varied from 4 to 37%, and was presumably due to decreased competition from the tartary buckwheat. (Division of Crop Ecology, Dept. of Plant Science, University of Alberta)

SPRING SOWN GRAIN

Summary W. J. Breakey

Of the 20 abstracts received only 6 are reported on here, the balance will be reported under their proper headings. Seven dealt with the use of the new chemicals CDAA and CDEC in the treatment of wild oats. One dealt with the use of Neburon on barley. In general, interest is swinging toward the use of the newer chemical herbicides in the treatment of grain crops.

Wheat

In general yield of Selkirk wheat when sprayed at the two-leaf stage with formulations of 2,4-D and MCP were lower than the checks, while the number of deformed heads increased as yields were decreased by the chemicals.

Barley

Olli barley sprayed with "Neburon" in 100 gal/A showed no effects on morphological characters when sprayed with 3.6 and 7.2 lbs/A. The 3.6 lbs/A increased the yield of the barley, while a 14.4 lb/A rate stunted the barley, reduced tillering and significantly decreased the yield of grain.

Three years' results show that the greatest control of horsetail (Equisetum arvense) with the least injury to the barley was accomplished when 4 and 8 oz/A of MCPA was applied after the weed had completed emergence and the barley was either in the late shot blade or early milk stage. Higher rate of the chemical significantly reduced the yield of barley.

Oats

Three ozs/A of 2,4-D, 2,4-DB and MCP gave excellent control of stinkweed, lambs quarters, and ball mustard growing in oats when treated at the 2-4 leaf stage. These treatments had little effect on hemp nettle, which composed 70% of the weed infestation. Rates of 6 oz/A of MCPB and higher gave 95% kills of hemp nettle. The addition of 2,4-D to the MCP did not appear to enhance the effectiveness of the MCP. Control plots which were hand weeded yielded 90.1 bus/A as compared with 53.5 bus/A for the weedy control plots. None of the treated plots exceeded 80 bus/A.

Oats treated with ½ and ¾ lb/A of MCP reduced bushel weight of Andrew oats likewise at both rates increased hull percentage of the upper and lower florets significantly.

Flax

Both CDAA and IPC were very effective in controlling wild oats in flax. The flax was undamaged in the CDAA treated plots even when seeded immediately after treatment. In plots treated with IPC, flax was killed unless seeding was delayed from three to four weeks.

IPC dissolved in anhydrous ammonia was ineffective in controlling wild oats in flax. The nitrogen fertilizer gave increased incidence of wild oats following this type of application.

Cultural

Continuous cultivation with either the blade cultivator or the one-way disc, eradicated infestation of hoary cress by the end of three years with a total of 22 to 24 cultivations during the three years. Barley and spring rye were found to be slightly superior to spring wheat for the control of hoary cress.

Abstracts

Early spraying of wheat with MCP and 2,4-D. Molberg, E. S. Different formulations of MCP and 2,4-D were applied to Selkirk wheat when the crop was in the two-leaf stage. All herbicides used were applied at 8 oz/A except the 4-(MCPB) which was applied at 16 oz/A. The plots were 13 ft by 419 ft and were not replicated. Yield tests were made by swathing and combining a 10 ft strip the full length of the plot. The check plot yielded 33.9 bu/A. Reductions in yield due to herbicides were as follows: butyl ester of 2,4-D 4.1 bu. amine salt of 2,4-D 1.8 bu, a mixture of sodium and potassium salts of MCPA 1.7 bu, amine salt of MCPA 1.6 bu, and sodium salt of MCPA 0.5 bu. The following treatments increased the yields by the amount shown: butyl ester of MCPA 0.9 bu, 4-(2,4-DB) 1.1 bu, and sodium salt of 4-(MCPB) 2.8 bu. The number of deformed heads in the plots increased as yields were decreased by the chemicals. (Contributed by the Experimental Farm, Regina, Sask.)

Effect of 1-n-butyl-3-(3,4-dichlorophenyl)-1-methylurea (Neburon) on Olli barley. Friesen, H. A. and D. R. Walker. Plots of Olli barley were knapsack sprayed with neburon at 14.4, 7.2 and 3.6 lb/A active ingredient. Water was used as a diluent at the rate of 100 gal/A. The barley was in the 5-leaf stage at the time of treatment. The plots were kept in a nearly weed-free condition throughout the growing season. A Latin Square design with four replications was used for this test. Results: The 7.2 and 3.6 lb/A rates had no effect on the morphological characteristics. The 3.6 lb/A increased the yield of the barley. The 14.4 lb/A rate stunted the barley, greatly reduced tillering and significantly decreased the yield of grain. (Contributed by the Experimental Farm, Lacombe, Alta.)

2,4-D, 2,4-DB, MCPA and MCPB for the control of annual weeds in oats undersown with legumes. Friesen, H. A. and D. R. Walker. 2,4-D butyl ester and 2,4-D alkanolamine each at 3 oz/A; 2,4-DB butyl ester at 3 and 6 oz/A; MCPA butyl ester at 3 oz/A; MCPA triethanolamine at 3 and 6 oz/A; MCPA potassium and sodium salt mixture at 6 oz/A and MCPB butyl ester at 3, 6, 12 and 18 oz/A were sprayed on annual weeds in oats undersown with legumes. Spraying was done at two dates, viz: an early date, when hemp nettle, *Galeopsis tetrahit*, the major weed species, was in the 2 to 4 leaf stage and a later date, when this weed was beginning to bud. The oats were in the 3-leaf and early shot blade stage at each of the two spraying dates, respectively. One-third of each plot was undersown to sweet clover, red clover and alfalfa. Treatment effect was measured against an unweeded control and one that was kept hand weeded throughout the season. Results: Plant counts and dry weight of weeds at flowering time showed that each formulation resulted in excellent control of stinkweed, *Thlaspi arvense*, lambs quarters, *Chenopodium album*, and ball mustard, *Neslia paniculata*, at each date of spraying. Hemp nettle, with an average density of 400 plants/sq. yd., accounted for some 70% of the weed infestation. In 1956, as in previous tests in 1954 and 1955, this species was not measurably affected by any of the 2,4-D treatments at either date of application. 2,4-DB in 1956 proved to be no more effective than 2,4-D. Each of the MCPB and MCPA treatments, except MCPA amine at 3 oz/A, gave sufficient kill and suppression of the nettle to result in significant yield increases of the oats, when applied during the seedling stage, date 1. The kill of nettle plants in 1956 with the

MCPA formulations approached 75%, which was considerably better than the 30% reduction in nettle stands attained with similar dosages in 1954 and 1955. The MCPB treatments were outstanding in 1956 in that the kills with this herbicide at dosages of 6 oz/A or higher reached 95%. At date 2 the nettle had acquired remarkable tolerance to all of the MCPA and MCPB formulations, consequently, the yield of oats was not significantly affected by any of the treatments. The control plots, which were hand-weeded throughout the season yielded 90.1 bus./A as compared with 53.5 bus./A for the weedy control plots. None of the MCPA or MCPB treated plots exceeded a yield of 80 bus./A.

Due to dry weather in the spring the nettles, which have large seeds, emerged earlier and formed a canopy over the somewhat later emerging legumes. This would largely explain the excellent survival of each legume species on each treatment. Further measurements of the legume survival will be made in the spring of 1957. (Contributed by the Experimental Farm, Lacombe, Alberta.)

<u>Effect of MCP and 2,4-D used singly or as mixtures on oats and some annual weeds</u>. Friesen, H. A. MCP butyl ester at 4 oz/A and 2,4-D butyl ester at 4 and 8 oz/A were sprayed on Eagle oats in the 3 to 4-leaf stage. The following mixtures were also applied, viz: 1. MCP ester at 4 oz/A and 2,4-DE at 2 oz/A; 2. MCP ester at 2 oz/A and 2,4-D ester at 4 oz/A; 3. 2,4-D amine at 4 oz/A and MCP amine at 4 oz/A; 4. MCP amine at 4 oz/A and 2,4-D ester at 4 oz/A; and 5. MCP sodium salt at 4 oz/A and 2,4-D ester at 4 oz/A. The test was not initiated until late summer. The oats were seeded on July 16, and were esentially weed-free. The above treatments were laid down on an area of fallowed land in order to observe the effect on the weeds. <u>Results</u>: The 2,4-D ester at 8 oz/A caused extreme leaf rolling (onion leaf), basal weakness or spreading of the tillers and a 3 to 4 inch reduction in plant height at heading time. Due to the late seeding, yields were not obtained. The 2,4-D ester at 4 oz/A resulted in similar but much less drastic symptoms. MCP ester at 4 oz/A very slightly affected the oats, the leaves were slightly narrower and paler in color, onion-leaf was not in evidence. The mixtures appeared to affect the crop in essentially the same manner as if each formulation had been applied singly, i.e. the mixing of MCP at 2 or 4 oz/A did not decrease the effect on the oats of 2,4-D ester at 4 oz/A but rather appeared to increase very slightly.

<u>Effect on the weeds</u>: Stinkweed, shepherds purse and wormseed mustard were in the seedling stage at the time of spraying and were killed by each of the treatments. Lambs quarters was better controlled by 2,4-D alone than by the 2,4-D-MCP mixtures, which in turn appeared a little more effective than MCP ester alone. However, the differences in reaction were very slight. 2,4-D alone resulted in little or no control of hemp nettle, while the MCP formulations gave effective control of this weed. The addition of 2,4-D to the MCP did not appear to enhance the effectiveness of the MCP.

In this test a modified Armstrong sprayer was used. No difficulty in application from settling out or precipitating due to the mixing of formulations was encountered. (Contributed by the Experimental Farm, Lacombe, Alta.)

<u>Effects of 2,4-D, MCP and 4-(2,4-DB) on Andrew oats</u>. Robinson, R. G., Jordan, L. S., and Dunham, R. S. Andrew oats were sprayed when one or two spikelets had emerged from the boot with 1/2 or 3/4 lb/A of 2,4-D, MCP, or 4-(2,4-DB). All formulations were the amine salt and applied at 20 gal/A. <u>Results</u>: No treatment reduced yields and all treatments controlled lambs quarters 100%. Lambs quarters were killed more slowly by 4-(2,4-DB) than by 2,4-D or MCP. Bushel

weights were unaffected except by MCP at both rates which reduced the weights significantly. Likewise MCP at both rates increased hull percentage of both upper and lower florets significantly. Hull percentages from the plots treated with (2,4-D) or 4-(2,4-DB) did not differ significantly from the check. MCP tended to reduce the weights of the lower florets in the spikelets. None of the herbicides significantly affected the weights of upper florets in the spikelets or the percentage of upper florets in the panicle. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3654 Sci. Jour. Series, Minn. Agric. Exp. Station).

Comparison, 2,4-D and MCPA when applied to weedy oats and flax fields, 1956. Wood, H. E., Craig, H. A. On 17 widely separated Manitoba farms 8 fields oats and 9 fields flax carrying average infestations of weeds common to the district had 5-acre blocks sprayed by the farmer as follows: Oats: 2,4-D ester 4 oz/A, 2,4-D amine 6 oz/A, MCPA ester 6 oz/A; flax: treated respectively 3, 5 and 5 oz/A. Late spring and mid-summer inspections indicated: Flax treated with MCPA showed either no or only slight, retardation in maturity and in height of stand, whereas the ester of 2,4-D caused considerable depression; the 2,4-D amine was intermediate in its effect. In the control of weeds the 2,4-D ester had the advantage of being effective on a wider range of species -- all treatments were effective on easier to kill weed species when treated in the early growth stages; where weed growth was more advanced at time of application or harder to kill weeds were encountered the relatively low dosages of the 2,4-D amine and MCPA were rather ineffective, whereas 2,4-D ester gave more control except on such weeds as wild buckwheat which requires a quite high dosage or repeat applications, to give a measure of control. A late and wet harvest prevented all cooperators from obtaining yield data. Data received failed to give a definite pattern of yields so is omitted. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada).

WINTER WHEAT

Summary

L. E. Anderson

In the study described below it was found that all fall treatments reduced tillering and delayed maturity. Water used alone as a carrier reduced the yield more than a combination of water and diesel oil.

Abstracts

Effect of 2,4-D in two carriers on irrigated Concho wheat. Wiese, A. F. and Rea, H. E. Two,4-D ester (propylene glycol butyl ether) was applied to Concho wheat at 0.5, 1.0 and 2.0 pounds per acre with either 40 gallons of water or 35 gallons of water plus 5 gallons of Diesel oil as the liquid carrier. The crop was sprayed in the fall of 1955 at the 3-tiller stage and at the full tiller stage in the spring of 1956. The experimental design was a split plot with 3 replications. The crop received 26 inches of rain and irrigation water. None of the spring applications affected yield, tillering, bushel weight or maturity. All of the fall treatments delayed maturity and reduced tillering. Yields were reduced significantly by the 2.0 pound applications of 2,4-D in the fall. The check yield was 44.3 bushels per acre, 2.0 pounds of 2,4-D in 40 gallons of water per acre reduced the yield to 36.3 bushels per acre and 2.0 pounds of 2,4-D in 5 gallons of Diesel oil plus 35 gallons of water reduced the yield to 38.8 bushels per acre. (Contribution of the Amarillo Experiment Station, Bushland, Texas, USDA and Texas Agricultural Experiment Station cooperating.) Approved as TAES T. A. 2509.

SORGHUM

Summary L. E. Anderson

Abstracts relative to weed control in sorghum included weed population studies, pre-emergence application of various herbicides, and the effect of foliar application at various growth stages on irrigated sorghum.

Under conditions of the experiment described all weed population levels resulted in a total crop failure. Of the pre-emergence treatments 6 lb./A a-chloro-N,N-diallylactemide (Randox) gave 90 percent weed control while K armex D L at 1.125 lb.A plus 1/2 lb. 2,4-D isopropyl ester gave 91 percent control. Sodium 2,4,5-trichlorophenoxy ethyl sulphate and tris-(2,4-dichlorophenoxy ethyl) phosphite were the only herbicides that injured the sorghum. When applied on irrigated sorghum, 2,0 lbs. 2,4-D amine/A. reduced yields at the 3-inch, 6-inch, and 23-inch stages, while 1.0 and 2.0 lb. rates applied at the flowering stage caused yield reduction. Other herbicides applied at the 8-inch stage did not reduce yields but delayed maturity.

Abstracts

The effect of various weed populations on grain sorghum. Phillips, W.M. Midland grain sorghum was planted May 31, 1956 in 20 in. rows on land infested with rough pigweed (Amaranthus retroflexus) and fireweed (Kochia scoparia). The crop and weeds emerged June 5-7. Following emergence five replications of the following weed populations, in the approximate ratio of 3 fireweed to one pigweed, were established by hand thinning: (1) one weed per 6 in. of sorghum row, (3) one weed per one ft., (3) one weed per 2 ft., (4) one weed per 3 ft., (5) no weeds, and (6) no weed control. The growing season was extremely dry but at the time of planting the soil was wet to a depth of 33 in. Only a small amount of moisture was available below this depth. The weeds and crop grew at approximately the same rate for about 3 weeks. Following that time the weeds, particularly the fireweed, grew at a much faster rate than the crop. Six weeks after emergence all weed populations had the same general appearance. Plants in the lower population plots branched profusely and all except the weed free plots appeared to be solid weed infestations. All weed populations caused complete failure of the sorghum crop. The weed free plot yields have not yet been determined. Although sorghum yields will be low, complete weed control enabled the crop to produce grain. (Contribution from Field Crops Research Branch, ARS, USDA, and Fort Hays Branch, Kans. Agric. Expt. Sta. Hays, Kans.)

Pre-emergence weed control in sorghum. Sand, P. F. Midland milo was planted June 5, 1956 at Lincoln, Nebraska and treated on June 8 before the sorghum emerged. The soil surface was dry at the time of treatment and no weed had emerged. On June 17, 1956, .41 of an inch of moisture was received with very light amounts of .01 to .10 for the next six days. On June 26 and 27, .70 and .98 inches of rain fell. The chemicals were applied in 60 gallons of water per acre. Weeds infesting the plots were pigweed and some foxtail. Estimates of weed control were made July 9, 1956.

Treatments and percent control (averages of three replications) are: Sodium 2,4,5-trichlorophenoxy ethyl sulfate at 4 and 8 lb./A gave 13 and 50 percent kill of weeds; 2,4-D amide at 1 and 2 lb./A gave 0 and 40 percent kill of weeds; 2,4-D isopropyl ester at 1 and 2 lb./A gave 40 and 63 percent kill of weeds; tris-(2,4-dichlorophenoxy ethyl) phosphite at 2 and 4 lb./A

gave 0 and 72 percent kill of weeds; Randox at 4 and 6 lb./A gave 63 and 90 percent weed control; Karmex DL at 1.125 lb./A plus 1/2 lb./A of 2,4-D isopropyl ester gave 91 percent weed control; alkanolamine salts of DNBP at 6 lb./A gave 82 percent weed control and the sodium salt of 2,3,6-tri chlorobenzoic acid at 1 lb./A gave 53 percent weed control. Sodium 2,4,5-trichlorophenoxy ethyl sulfate and tris-(2,4-dichlorophenoxy ethyl) phosphite were the only chemicals that had detrimental effects on the sorghum. Both of these chemicals reduced the stands and caused severe stunting. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

<u>Effect of 2,4-D on irrigated sorghum.</u> Wiese, A. F. and Rea, H. E. In 1955, 2,4-D amine (ethanol and isopropyl series) was applied at 0.0, 0.5, 1.0 and 2.0 pounds per acre at 9 stages of Redbine 60 sorghum growth. The growth stages were 3 inches, 6 inches, 10 inches, 15 inches, 20 inches, 23 inches, 25 inches, boot and flowering. The experimental design was a split plot with 3 replications. The crop received 9 inches of rainfall and three 6-inch irrigations during the growing season. Yields were greatly reduced by the 2.0 pound rate at the 3-inch, 6-inch and 23-inch stages and by the 1.0 and 2.0 pound rate at the flowering stage. The 2.0 pound rate applied to 6-inch sorghum delayed maturity 3 days. The treatments did not cause any growth abnormalities or affect sorghum height. The check yields averaged 3404 pounds per acre and the greatest yield reduction, 1000 pounds per acre, resulted when 2.0 pounds per acre was applied at the flowering stage.

In another test, 2,4-D amine (ethanol and isopropyl series), 2,4-D ester (butoxy ethanol), 2,4-dichlorophenoxypropionic acid (butoxy ethanol ester) and 2,4,5-trichlorophenoxypropionic acid (butoxy ethanol ester) were applied at 1.0 and 2.0 pounds per acre to 8-inch Redbine 60 and Westland sorghum. Yields were not reduced by the chemical treatments, but all of the treatments except 2,4,5-trichlorophenoxypropionic acid at 1.0 pound per acre caused a delay of 2 or more days in maturity. (Contribution of the Amarillo Experiment Station, Bushland, Texas, USDA and Texas Agricultural Experiment Station cooperating.) Approved as TAES T.A. 2508.

Corn

Summary **D. W. Staniforth**

Interest in herbicides for the control of annual weeds in corn continued at a high level in 1956, judging from the number of abstracts received. Abstracts reported results of experiments with a number of promising herbicides for annual weeds in corn. Although results obtained with some newer materials were promising, additional regional testing must preclude general recommendations of their use. No changes were made in the recommendations for the use of herbicides for annual weed control in corn.

Several investigators reported the results of field evaluations of a-chloro-N,N diallylacetamide (CDAA). In general, pre-emergence applications at rates of 4 lb./A and up, gave good control of annual grass weeds, somewhat poor control of most broad-leafed weeds, and caused no appreciable injury to corn. Post-emergence applications, either to 1-2 leaf corn or 3-4 leaf corn did not give consistently effective grass control.

Pre-emergence treatments with Simazin (2-chloro-4,6-bis(ethylamino)-s-triazine) in general resulted in very good control of annual weeds, and at the lower levels of treatment produced little or no corn injury. Rates of 2 to 4 lb./A appeared to give optimum results, with some injury noted at the higher rate in a few tests. Simazin, on the basis of this year's tests, warrants further extensive testing as a corn herbicide.

Results with Karmex DL were erratic. Early post-emergence applications of 3-5 pints per acre gave results ranging from no weed control to rather good control. Corn injury was similarly varied and unpredictable.

A few reports discussed the use of ATA, Dalapon, and TBA materials as layby sprays for the control of annual grasses in corn. Results were promising in some cases, but corn injury may be a problem with the most effective herbicide combinations.

A few tests were reported on the use of DNBP as an early post-emergence spray. Results were in general agreement with those of other years, namely, fairly good weed control with varying degrees of leaf burn on corn.

Two abstracts were concerned with role of shallow cultivation in conjunction with herbicide treatments, and subsequent follow-up cultivations.

Pre-emergence treatments for control of annual weeds in corn. Bayer, D. E. and Buchholtz, K. P. Corn hybrid W464A was planted on May 21. Three days later herbicides were applied pre-emergence in 20 gallons of water per acre. The soil surface was dry at time of application with a light sprinkle of rain falling that evening. Little or no rainfall was obtained until June 18. Plots were 2 rows wide and 22 feet long. Soil was Miami silt loam. No cultivation was given any of the plots through the season with the exception of the cultivated checks which were kept weed-free from June 7 through the remainder of the season. Both broadleaved and grassy weed counts were made from quadrats on June 28. Corn height measurements were taken on July 5 when it was thought maximum effects of the herbicide would be exhibited

Corn plant numbers per plot were taken on July 12 to measure the effect of the herbicide on the emergence of the corn. When the corn was mature the grain was harvested and yields calculated.

Material	Lb./A	Grass weeds no./sq.ft.	BL weeds no./sq. ft.	Corn plants	Corn height inches	Corn yield bu/A
CDAA	8	1.4*	1.7*	34	48	99.8
CDAA	4	1.9*	1.2**	34	48	97.8
2,3,6-TBA	2	5.8	0.0**	34	48	97.1
Simazin	4	1.4*	0.2**	33	49	96.5
Diuron	1.5	5.6	0.4**	36	48	94.9
2,3,6-TBA	1	7.3	0.2**	33	50	94.3
Neburon	3	5.6	0.9**	34	46	90.4
CDT	8	6.4	0.3**	32	48	90.4
CDAA+2,4-D	2 + .75	1.7*	0.6**	30	47	90.0
CDAA	2	3.2	3.2	34	48	88.9
2,4-D amine	2	4.0*	0.2**	33	48	86.8*
2,4-D ester	2	3.5*	0.9**	34	47	86.6*
Monuron	1.5	11.0	2.4*	33	47	83.5**
CDT	4	10.7	1.6**	34	48	79.6**
2,4-D amide	2	9.0	0.7**	30	46	76.4**
CDAA+2,4-D	4 + .75	1.5*	0.1**	29	46	72.0**
Weedy check	--	11.4	3.9	35	46	80.6**
Cult. check	--	--	--	32	48	98.7
LSD 5 pct. level		Trans.	Trans.	--	--	10.2
LSD 1 pct. level						13.5

The herbicides did not significantly affect the number or height of corn plants per plot. Both the 4 and 8 lb./A applications of CDAA gave good weed control with no significant effect on the yield but gave relatively better grassy weed control than broadleaved weed control. 2,3,6-TBA at both 1 and 2 lb./A gave good broadleaved weed control but only fair grass control. Simazin (2-chloro-4,6-bis(ethylamino)-s-triazine) gave good control of both broadleaved and grassy weeds and had no apparent effect on the corn yield. A possible explanation for the low placing of CDAA+2,4-D ester combination at 4 and 0.75 lb./A, respectively, may have been the low stand of corn plants on plots treated with this combination. (Dept. of Agronomy, Univ. of Wisc., Madison.)

<u>Comparison of various herbicides for control of giant foxtail (Setaria faberii) growing in corn.</u> Blanchard, K. L. and Dunham, R. S. A moderate infestation of giant foxtail, growing in corn near St. Claire in south central Minnesota, was treated July 16, 1956, with (1) DNBP amine at 4.0 lb/A, (2) ATA at 2.0 lb/A, (3) ATA plus 2,4-D ester at 2.0 + 0.5 lb/A, (4) dalapon plus 2,4-D ester at 1.0 + 0.5 and 1.5 + 0.5 lb/A, (5) sodium trichloropropionate at 4.0, 6.0, and 8.0 lb/A, and, (6) baron at 1.0, 2.0, and 3.0 lb/A. Corn was past the usual "lay-by" stage and ear formation was just beginning. Corn plants were sprayed only to a 6-inch height above the ground. Duplicate plots each consisting of 4 rows, 1 rod long, were used for each treatment

level and all plots were randomized within the experimental area. Soil moisture was above normal before the trials and adequate throughout the duration of the trials. On September 4 observations were taken as to the control of the giant foxtail, and, on October 8 the corn was harvested from each plot and yield determinations made. Results: Control of 70% or better was obtained with (2), (3), (4), (5) at 6.0 rate, and (6) at 2.0 and 3.0 lb. rates. Yield data have not been subjected to analysis but it is evident that the only major reduction in yields came from baron at the 2.0 and 3.0 lb. rates. (Contributions of Minnesota Department of Agriculture, and The Department of Agronomy and Plant Genetics, Institute of Agriculture, University of Minnesota, St. Paul, Minn. Paper No. 3670. Scientific Journal Series, Minn. Agricultural Experiment Station.)

Herbicides on corn. Bondarenko, D. D. and Willard, C. J. K-62 corn was planted in 42-inch rows on June 7, 1956. German millet was sown as an annual grass infestation. All plots had a natural infestation of red-root pigweed. Triplicate 4-row plots were band-treated (20-22 inch bands) over the corn rows with each rate of each herbicide. The following were applied pre-emergence on June 8: 3-(3,4-dichlorophenyl)-1,1-dimethyl urea (Karmex DL) at 2 and 4 pints/A; alpha-chloro-N,N-diallylacetamide (Randox) at 3, 6, and 9 lb/A; PGBE ester of 2,4-D at 1½ lb/A; 2,4-dichlorophenoxy-acetamide (Emid) at 2 lb/A; PGBE ester of 2-(2,4,5-trichlorophenoxy) propionic acid (Kuron) at 1½ lb/A; sodium 2,3,6-trichlorobenzoate (TCB from Du Pont) at 1, 2, 3, and 4 lb/A; polychlorinated benzoic acids (ACP M-103-A) at 2 and 4 lb/A; polychlorinated benzoic acids X80EO and X33EO (Hooker) at 2 and 4 lb/A; tris-(2,4-dichlorophenoxyethyl) phosphite (3Y9) at 2 and 4 lb/A; 2-chloro-4,6-bis(diethylamino)-s-triazine (Geigy 444E) at 8 and 12 lb/A; and 2-chloro-4,6-bis(ethylamino)-s-triazine (Geigy Simazin) at 1, 2, and 4 lb/A. Plots were treated at emergence with Premerge (DNBP) at 3 lb/A, and 3-amino-1,2,4-triazole (Amizol) at 1/8, 1/2, and 1 lb/A. Other plots were treated when corn was in the 4-leaf stage with Karmex DL at 2 pints/A; Karmex DL at 1, 2, 3, and 4 pints/A plus 1/2 lb/A 2,4-D amine; TCB (Du Pont) at 1 and 2 lb/A; Premerge at 3 lb/A; and Amizol at 1/8, 1/2, and 1 lb/A. Other plots were treated at lay-by, striking the bases of the corn only, with Amizol at 2, 4, and 8 lb/A and at 1/16, 1/8, 1/4, 1/2, and 1 lb/A on plots previously band-treated at emergence at these rates. All rates except of Karmex DL are in terms of active ingredients. They are overall rates; the amount actually applied was half these. All were applied in 40 gpa water. Pre-emergence herbicides most satisfactory from standpoint of weed control and crop tolerance were Geigy Simazin at 4 lb/A, Randox at 3 to 9 lb/A, Geigy 444E at 12 lb/A, Karmex DL at 4 pints/A, and the PGBE ester of 2,4-D at 1½ lb/A. TCB at 4 lb/A gave good control of redroot and fair control of millet but was slightly injurious to corn. Emid at 2 lb/A, X80EO and X33EO at 2 and 4 lb/A, and ACP M-103-A at 4 lb/A gave good control of redroot, but not millet. Kuron and 3Y9 were unsatisfactory at the rates applied. At the 4-leaf stage, Premerge at 3 lb/A, Karmex DL at 2 pints/A (alone or plus 1/2 lb/A 2,4-D amine), and Amizol at 1/2 and 1 lb/A gave excellent results. Slight injury to corn resulted following each treatment but recovery was apparently complete. The addition of 1/2 lb/A of 2,4-D amine to Karmex DL at 2 pints/A was without apparent effect. Amizol at 1/2 and

1 lb/A applied at emergence gave satisfactory results, with no additional benefit resulting from re-treatment at lay-by. Premerge at 3 lb/A applied at emergence gave only fair results; millet had not fully germinated. TCB was ineffective as a post-emergence herbicide. Amizol at 2, 4, and 8 lb/A at lay-by was extremely injurious to corn; the weed control was good at 4 and 8 pounds. (Contribution of the Ohio Agricultural Experiment Station.)

<u>Herbicides for weed control in fodder corn.</u> Brown, D. A. Nodak hybrid blend, seeded in continuous rows 36 inches apart was used in this experiment. Herbicides were applied in 10 gal. water per acre as an overall spray; stage one, when the crop was 7 inches high and, two; when 12-14 inches high. Plots were infested uniformly with lambsquarters and red root pigweed, stinkweed, wild buckwheat, flat spurge, and green foxtail. <u>Results</u>:

Treatment per acre			Overall weed control %	Yield green corn tons/A Stage growth 7"	12-14"
MCP butyl ester	3 oz.	leaf roll weakened stalks	45	26.7	24.8
MCP " "	6 oz.	severe leaf roll and break over stems	73	26.4	23.1
MCP diethanolamine	4 oz.	leaf roll weakened stalks	40	26.8	24.3
MCP "	6 oz.	"	50	25.2	25.3
CMU	1 lb.	much break-over of stalks	5	24.3	20.4
CMU	2 lb.	severe break-over of stalks	20	24.0	17.1
CMU MCP diethanolamine	½ lb. 8 Oz.	severe break-over of stalks	75	24.3	23.7
Check - no treatment		heavy weed growth	25.5		

MCP ester and amine gave very little control of wild buckwheat and mediocre control of red root pigweed. Flat spurge can only be controlled with very high rates of 2,4-D or MCP, CMU afforded control of only the green foxtail and only at the 2 lb. rate. The combination of MCP amine and CMU injured corn more than other treatments but gave the best weed control. Less damage occurred to corn stalks at the 7 inch than the 12-inch stage. While stalks were weakened perceptibly by all herbicides the yields were only significantly reduced by CMU at

the 12-inch stage. (Experimental Farm, Brandon, Manitoba.)

<u>Effect of ATA and TBA on corn when applied before the seedbed was prepared.</u> Derscheid, Lyle A. Duplicate 1-rd. by 3-rd. plots were treated in 3 experiments. Experiment I was conducted in 1955 on a loam soil derived from glacial till. ATA and a sodium salt of 2,3,6-TBA were each applied at 2 and 4 lb./A, active ingredient in 10 and 40 gal./A of spray on leafy spurge foliage on May 17. On May 26 the area was plowed and planted to corn. Experiment II was conducted at the same location in 1956. ATA was applied at 4, 6, and 8 lb./A and TBA at 1, 2, and 4 lb./A on May 12. The land was plowed May 23 and seeded to corn June 1. Experiment III was identical to Experiment II except that it was conducted at a different location on a loam soil derived from glacial lake sediments. The spraying was done May 26, the plowing and planting were done June 6.

No injury to the corn was observed in experiments I and II and corn yields from all plots of Experiment I were between 50 and 60 bu./A further indicating that no damage had been done to the corn. In Experiment III the corn emerged normally, but soon began to die on TBA treated plots. By July 3, the stand had been reduced 90 percent on all plots treated with TBA and 15 to 30 percent on all plots treated with ATA. A possible explanation for the contrast in results might be attributed to rainfall. On Experiments I and II there was an above normal amount of rainfall, shortly after planting time, which may have leached the chemical into the soil. On Experiment III there was less rainfall. It appears that the chemical may have remained at the bottom of the plow sole and killed the corn when the roots reached that point. (Contributed by the Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota.)

<u>The effectiveness of several chemicals for annual grassy weed control in corn.</u> Derscheid, Lyle A. Corn was drilled into an area that had a heavy infestation of green and yellow foxtails, a light infestation of wild oats and a sprinkling of annual broad-leaved weeds. Duplicate 2-row by 50-ft. plots were treated at 3 dates in 1956. Pre-emergence applications of CDAA at 4, 6, and 8 lb./A and of 2,4-D ester at 1, 2, and 4 lb./A were made May 29, two days after the corn was planted. All rates of CDAA held the weeds in check for about 2 weeks and none of the 2,4-D treatments had any effect.

When the corn was in the 2-leaf stage and weeds were emerging wettable powders of monuron, diuron, and fenuron were applied at 2,4, and 8 lb./A. Neburon was applied at 2 and 3 lb./A and DNBP at 2, 3, and 4 lb./A. Both rates of DCU killed all of the grassy weeds and the corn, but allowed broad-leaved weeds to grow. All rates of diuron, monuron, fenuron, and neburon killed everything. In previous years rates of 4 and 8 lb./A of monuron had failed to kill foxtail on the same area. The 4 lb./A rate of DNBP thinned the stand of grassy weeds 50 per cent and caused 10 per cent reduction in stand of corn. The two lower rates had less effect on both the weeds and corn. None of these plots were cultivated.

Other plots were cultivated 3 times and were sprayed with directed sprays after the 3rd cultivation when foxtail in the row was about 6 inches tall. ATA was applied at 4, 8, and 12 lb./A, dalapon at 2, 3, and 4 lb./A, TCA at 5 and 7 lb./A, four TBA formulations at 1/2 lb/A and three 2,4-D mixtures containing 2 lb./A of 2,4-D ester and either

4 lb./A of ATA, 5 lb./A of TCA or 3 lb./A of dalapon. Liquid ammonium nitrate mixed with a low volatile ester of 2,4-D and a detergent was applied at 3 rates (1) 40 lb. of ammonium nitrate, 1/8 lb. of 2,4-D and 3/4 lb. of Fab per acre, (2) 80, 1/8 and 3/4 and (3) a 40, 1/8 and 3/4 treatment retreated one week later. The ammonium nitrate burned the leaves of the weeds and the lower leaves of the corn, but both outgrew the effects. At harvest time it was observed that dalapon at 4 lb./A and ATA at 8 and 12 lb./A had reduced the stand of foxtail about 75 per cent. All 4 of TBA treatments, ATA at 4 lb./A, dalapon at 3 lb./A, and the 2,4-D mixtures containing ATA and dalapon had reduced the stand of weeds about 50 per cent. TCA was not effective. There was no apparent injury to the corn by any of these treatments.

These results indicate that CDAA may be useful for a pre-emergence weed killer if it is followed with cultivation and if its undesirable caustic properties can be moderated. DNBP can be useful if used at 4 lb./A when the corn is in the 2-leaf stage, but the urea compounds should be used with caution. Dalapon and ATA and perhaps TBA can be useful for killing annual grassy weeds at layby time, but TCA and liquid ammonium nitrate are ineffective when the weeds get to be six inches tall. They may be effective if applied earlier, however. (Contributed by the Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota.)

Simazin [2-chloro-4,6-bis(ethylamino)-s-triazine] for weed control in corn. Fletchall, O. Hale. Simazin at 2 lb./A pre-emergence without cultivation gave virtually 100% weed control in corn for the whole season in a field with a very heavy natural infestation of weeds. Corn yielded 106 bu./A compared with 45 bu./A on the untreated, uncultivated check, and 79 bu./A with 1 1/2 lb./A 2,4-D ester pre-emergence. 4 lb./A and 8 lb./A of Simazin gave equally weed-free plots but corn yields were 95 and 91 bu./A, respectively, indicating that the higher (unnecessary) rates caused some injury to the corn. (Contributed by the Missouri Agricultural Experiment Station, Journal Series No. 1680.)

Test of herbicides on corn at the coleoptile stage for early weed control. Freeman, J. F. Ky. 102 corn was planted June 12, 1956, in Maury silt loam soil. Rains beginning June 13 kept the soil moist during the following 6 weeks. Corn began emerging June 16 and was at coleoptile stage, and weeds beginning to emerge June 18 when spray treatments, 32 gal./A were made. DNBP at 3, 4.5, and 6 lb/A; CDAA at 2, 4, and 6 lb./A, and 4 lb + 1/2 lb 2,4-D (Amine); NPA (Alanap-3) at 2, 4, and 6 lb./A; monuron at 0.8, 1.2, and 1.6 lb./A and 1.2 lb. + 0.5 lb. 2,4-D; diuron at 0.5, 1, and 2 lb./A, and 1 lb. + 0.5 lb. 2,4-D; cultivated check; and uncultivated check were treatments used in the randomized block design experiment with 4 replications. Weeds were crabgrass, stinkgrass, and pigweed. Yield data are not yet available, but visual ratings made July 8 before clean cultivation of all plots, are being used. Results: CDAA at all rates resulted in good weed control, no reduction in stand or vigor of corn. The CDAA + 2,4-D combination treatment gave nearly perfect weed control without harm to the corn. NPA at all rates gave good control of weeds, though slightly poorer than did like rates of CDAA, no stand and little vigor reduction of the crop except at highest rate. DNBP at all rates gave excellent weed control, little reduction in stand, though a slight reduction

in vigor of corn. Monuron at all rates resulted in complete control of weeds, slight reduction in stand of corn at 0.8 lb., considerable at 1.2 lb., and two-thirds reduction at 1.6 lb./A. Vigor was reduced considerably at the lightest rate used and was more pronounced with increase in rate. The combination with 2,4-D was useless. Diuron controlled weeds completely even at 0.5 lb./A and at this rate reduced stand of corn very little though vigor of growth was reduced moderately. The 2 lb./A rate destroyed stands of corn, and at 1 lb. reduced final stands about 60 per cent and vigor of growth about 70 per cent. The combination with 2,4-D was not beneficial. (Agronomy Department, Kentucky Agricultural Experiment Station.)

Herbicides on corn at 2-5 leaf stages for early weed control. Freeman, J. F. Ky. 102 corn was planted June 9 on Burgin silty clay loam soil. Rains starting June 13 as corn emerged were favorable to rapid emergence of weeds also. The experiment was a randomized block design with treatments replicated 4 times. Weeds were crabgrass, pigweed, and carpetweed. Treatments made June 20 when corn had 2-4 leaves were monuron at 0.4, 0.8, and 1.6 lb./A; diuron at 0.8, 1.2, 1.6 lb./A, and 1.2 lb. + 0.5 lb. 2,4-D (Amine). Delayed treatments due to rainy weather made June 26, when corn had 4-5 leaves were CDAA at 2, 4, and 6 lb./A and 4 lb. + 0.5 lb. 2,4-D (Amine); DNBP at 3 and 6 lb./A; Amine salt of 2,4-D at 0.5, 1, and 2 lb./A; cultivated check, and uncultivated check. Water sprays of the various materials were used at 32 gal/A - those at the first date over the top of the corn, those at the later date placed to the base of the corn plants. Since yield date are not yet available, visual ratings made July 14 on stand and vigor reductions due to treatment, together with weed control ratings of the same date are used. Results: Monuron at 0.4 lb./A resulted in excellent control of all weeds with no reduction in stand of corn and only slight reduction in vigor. At 0.8 lb. stand was not reduced but corn was stunted appreciably. At 1.6 lb./A stand was reduced moderately and vigor considerably. DNBP at 3 and 6 lb./A controlled broadleaves completely and grasses 85 and 90% with no reduction in stand of corn and little reduction in vigor of growth at either rate. CDAA at all rates in this post-emergence application gave only moderate control of crabgrass and poor to fair control of pigweed. Stand and vigor of corn was affected little at either rate. Combination of the medium rate and 2,4-D completely controlled pigweed without apparent harm to the corn. 2,4-D in the placement type of spraying used caused little permanent harm to the corn even at the 2 lb./A rate, gave nearly complete control of broadleaf weeds and fairly good early grass control even at the 0.5 lb. rate. Diuron at all rates gave excellent weed control; at the two higher rates stands were reduced slightly and growth retarded considerably, especially at the highest rate. The use of 2,4-D as a supplement to medium rates of monuron or diuron was useless but did not harm the corn. (Agronomy Department, Kentucky Agricultural Experiment Station.)

The performance of diallyl acetamide incorporated into the soil for grass control in corn. Gantz, R. L. and Slife, F. W. The most important factor affecting the results of pre-emergence treatments is rainfall after application. An experiment was conducted to try to eliminate this variable by incorporating the chemical into the seedbed. Diallyl acetamide was used at 2 and 4 lbs. acid per acre under 3 con-

ditions: (1) disced into the soil at a depth of 3 to 4 inches previous to planting; (2) harrowed into the soil at a depth of 1 to 2 inches prior to planting; (3) as a pre-emergence treatment immediately after planting. No visible injury symptoms to the corn were noticeable at any rate from any type of treatment throughout the growing season. Rain fell 6 days after corn planting and at that particular time grass weeds were becoming visible in the pre-emergence plots but not in the incorporation treatments. This rainfall apparently leached the chemical into the soil and killed the grass weeds on the pre-emergence plots. Another week without rainfall might have produced different results. Weed control was excellent at the 4 lb. rate of all treatments but less effective at the 2 lb. rate. The disced treatments allowed grass to germinate at the end of 3 to 4 weeks while the harrowed treatments were excellent for 6 weeks. Yield data has not been processed as yet. (Contribution of the Illinois Agricultural Experiment Station, Urbana, Illinois.)

A comparison of methods and equipment for controlling weeds in field corn. Lovely, W. G. Iowa 4298 hybrid corn was planted on Webster loam soil May 10, 1956. Two and three cultivations were used alone and in combination with rotary hoeing and weeding at the two- and four-leaf stages of corn. In addition overall and strip applications of 2,4-D ester pre-emergence and 2,4-D amine at the two-leaf stage were used in combination with two cultivations. Because of the abnormally dry conditions that persisted through the growing season, it was impossible to obtain corn yields. Plant stand and weed weights were taken on August 8. In general, weed control was satisfactory on all treated plots. However, there were some marked differences as shown by the weed weight samples. As compared to three cultivations, using the weeder or rotary hoe once or twice plus the three cultivations did not decrease the amount of weeds per plot. Fewer weeds were obtained from the plots where the weeder was used than where the rotary hoe was used. Where only two cultivations were used, the rotary hoe did not improve the weed control obtained, but the weeder did. Using the rotary hoe and the weeder at the two- and four-leaf stage, in addition to two cultivations gave fewer weeds than two cultivations. 2,4-D amine and 2,4-D ester applied at the rate of two pounds per acre pre-emergence and at the two-leaf stage, respectively, gave better control than any of the other treatments. The stand counts indicate a small loss in stand due to cultivations. In general, the weeder reduced the stand more than the rotary hoe and in some of the plots this reduction was serious. 2,4-D applications had no apparent effect on the stands. The results of this experiment indicate that shallow cultivating tools such as weeders and rotary hoes used in addition to or in combination with three cultivations do not materially improve the weed control obtained. As in previous experiments of this type, pre-emergence applications of 2,4-D ester and early post-emergence applications of 2,4-D amine in overall and band application plus two cultivations gave equal to or better than the weed control obtained with three normal cultivations. (Contribution of Department of Agricultural Engineering, Iowa Experiment Station and Farm Machinery Section, A.R.S., USDA.)

Results of pre- and post-emergence application of herbicides in corn on mineral and muck soils. Rogers, B. J., Hart, R. D., and

Ingle, M. Tests were made on two soils in 1956. (A) Plots were on mineral soil, a Toronto silt loam located just north of Lafayette, Indiana. The weather was dry and cool at the time of pre-emergence application. The weeds included principally Hibiscus trionum, Digitaria sanguinalis, Polygonum sp., Setaria sp., Portulaca oleracea, Mollugo verticillata, and Convolvulus arvensis. In addition, oats were drilled in and rape sown broadcast over the area. Pre-emergence applications were made the day after planting; post-emergence applications at the 3-4 leaf stage. The chemicals used were (1) polychlorobenzoic acids, pre-emergence (Hooker X-33 at 1, 2, and 4 lbs./A; X-88 at 1/2, 1, and 2 lbs./A; (2) 2,4-D (butyl ether esters) at 2 lbs./A pre-emergence and 1 lb./A post-emergence; (3) alpha-chloro-N,N-diallylacetamide (CDAA) pre-emergence at 2 and 4 lbs./A; (4) CDAA at 2 and 4 lbs./A plus 1 lb./A of 2,4-D pre-emergence; (5) 2-chloro-4,6-bis(ethylamino)-s-triazine (Simazin) pre-emergence at 4 and 8 lbs./A; (6) 3-(3,4-dichlorophenyl)-1,1-dimethylurea (DL) at 1.125 and 1.775 lbs./A and 1.125 lbs./A plus 1/2 lb./A of 2,4-D, both pre- and post-emergence; and (7) tris-(2,4-dichlorophenoxyethyl)-phosphite (3Y9) pre-emergence at 1 and 2 lbs./A. Outstanding control (80-90%) throughout the growing season of annual weeds, both broadleaves and grasses, resulted from both rates of Simazin. No apparent injury to the corn was observed. The heavier rate of DL and the combination with 2,4-D gave fair (60-70%) pre- and post-emergence control. Some stunting of the corn was observed, but the corn grew out of it. As for the other chemicals, the highest rates of each chemical gave about 50% control. (B) Plots were on a muck soil located near Walkerton, Indiana. The weather was wet and cool at the time of pre-emergence treatment. The major weeds in the field were Amaranthus sp., Digitaria sanguinalis, Polygonum sp., Portulaca oleracea, and Mollugo verticillata. The pre-emergence applications were made 2 days after planting. The post-emergence applications were made at the 3-5 leaf stage. Chemicals used were (1) polychlorobenzoic acids pre-emergence (TCB-duPont at 1, 2, and 3 lbs./A, and TCB-Hooker at 2, 4, and 6 lbs./A; (2) Simazin at 4 and 6 lbs./A pre-emergence; (3) CDAA at 4 and 6 lbs./A and at 4 and 6 lbs./A plus 1 lb./A of TCB-duPont pre-emergence; (4) CMU (DW) at 2, 4, and 6 lbs./A pre-emergence and 1 and 2 lbs./A post-emergence; and (5) 2,4-D (amine salt) at 4 lbs./A pre-emergence and 1 lb./A post-emergence treatment. The pre-emergence treatments were far superior to any post-emergence treatment. CDAA at 4 and 6 lbs./A plus 1 lb./A of TCB gave the best over-all control (60-75%). Simazin at 6 lbs./A gave about 50% control. Other treatments gave from 10 to 40% control. The CMU treatments caused some stunting but the corn grew out of it. Yield data indicated that no treatment was superior to any other, and that no lasting injury was caused by any of the chemicals. (Contribution by the Dept. of Botany and Plant Pathology, Purdue University, Agric. Expt. Sta., Lafayette, Indiana.)

Giant foxtail control in corn. Robinson, R. G., Jordan, L. S., and Dunham, R. S. Minhybrid 507 was sprayed pre-emergence, at the 2-leaf stage, or at the 30-inch (layby) stage. Herbicides and rates in lb./A were: (1) pre-emergence - NPA 4; 3Y9 4; 2,4-DES 4; CDAA 4 or 6 and CDAA 6 plus 2,4-D LV ester 1/2; CP9802 4 or 6 and CP9802 6 plus 2,4-D LV ester 1/2; (2) 2-leaf stage - 2,4-DES 4; CDAA 4 or 6 and CDAA 6 plus 2,4-D amine 1/2; CP9802 4 or 6; neburon 4 or neburon 4 plus 2,4-D amine 1/2; diuron 1½ or diuron 1½ plus 2,4-D amine 1/2; DNBP

amine 4; (3) corn 30 in. foxtail 18 in. tall - DNBP amine 4; ATA 2 plus 2,4-D LV ester 1/2; dalapon 1 plus 2,4-D LV ester 1/2; dalapon 1½ plus 2,4-D LV ester 1/2; dalapon granular 1 plus 2,4-D LV ester 1/2; dalapon granular 1½ plus 2,4-D LV ester 1/2; Shell 1369 2; endothal 4 plus 2,4-D LV ester 1/2. The 30-inch stage was cultivated 3 times and the other two stages twice. At the 30-inch stage, the spray was directed to contact only the lower 6 inches of corn and foxtail. <u>Results</u>: Of the pre-emergence treatments only CDAA alone and in combination with 2,4-D gave good control, and the corn yielded more than the cultivated check. At the 2-leaf stage CDAA alone and with 2,4-D, neburon with 2,4-D, diuron alone and with 2,4-D, and DNBP gave good control and the corn yielded more than the cultivated check. The addition of 2,4-D to neburon or diuron resulted in better foxtail control than either one alone. Neburon and diuron treated plants showed temporary leaf injury. At the 30-inch stage no treatment killed foxtail, however, no seed was produced on plots treated with dalapon at 1½ lb. and only a trace of seed was produced on plots treated with dalapon at 1 lb. or granular dalapon at 1½ lb. There was no reduction in yield of corn from any treatment when compared to the check. The outstanding treatments in the entire experiment were CDAA. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3650, Sci. Jour. Series, Minn. Agric. Expt. Station.)

<u>Pre-emergence weed control in corn</u>. Sand, P. F. Field corn was planted May 18, 1956 and treated on May 22, 1956 just before emergence. The soil surface was dry at the time of treatment. Ninety-one hundredths of an inch of rain fell on May 26 and .82 on May 29. All chemicals were applied in 60 gpa of water except the oil soluble trichlorobenzoic acid which was applied in 20 gpa of oil. Weeds infesting the plots were foxtail and pigweed. Estimates of weed control were made on June 18, 1956.

Treatments and per cent weed control are 2,3,6-trichlorobenzoic acid (oil soluble) 1/2, 1, and 2 lb./A gave 53, 72, and 87 per cent weed control; sodium salt of 2,3,6-trichlorobenzoic acid at 1/2, 1, and 2 lb./A gave 22, 70, and 72 per cent weed control; polychlorobenzoic acid at 1/2, 1, and 2 lb./A gave 30, 47, and 47 per cent weed control; 2,4-D isopropyl ester at 1 and 2 lb./A gave 40 and 55 per cent weed control; 2,4-D amine at 1 and 2 lb./A gave 37 and 67 per cent weed control; Randox at 4 and 6 lb./A gave 83 and 90 per cent weed control; 2,4-D amine at 1 and 2 lb./A gave 32 and 45 per cent weed control; tris-(2,4-dichlorophenoxy ethyl) phosphite at 2 and 4 lb./A gave 27 and 43 per cent weed control. Figures on per cent weed control are averages of three replications. Yields tests were not made due to drought. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

<u>Post-emergence herbicides for corn</u>. Slife, F. W. Several rates of 3,4-dichlorophenyl dimethyl urea (Karmex DL) were applied to corn at two stages of growth. Rates used were 2, 2½, 3, and 4 pints of Karmex DL alone and the same rates each combined with 1/2 lb. 2,4-D amine. Applications were made to corn on May 24, 1956 and again to new plots June 3, 1956. On May 24 the corn had from 1 to 2 leaves and on June 3 the corn was developed to the 5 leaf stage of growth. Weeds, both grass and broadleaf, had from 1 to 2 leaves at the 1st

treatment date and from 3 to 4 leaves at the 2nd treatment date. Exceptionally good weed control was obtained with $2\frac{1}{2}$, 3, and 4 pints of DL alone and with 2,4-D at the 1st treatment date. Poor weed control resulted from the 2nd treatment at all rates with the best results being obtained at 4 pints of DL with 2,4-D. Slight corn stunting resulted at the 4 pint rate of DL with and without 2,4-D at the 1st and 2nd treatment dates. This stunting disappeared after several weeks and the corn appeared normal after that time. Yields were not affected greatly by any rate of treatment. (Contribution of the Illinois Agricultural Experiment Station, Urbana, Illinois)

Pre-emergence and early post-emergence spray and cultivation for weed control in corn. Staniforth, D.W. Corn hybrid C92 was planted May 7. On May 8 pre-emergence applications of 2,4-D ester, 1 and 2 lb./A and CDAA 2 and 4 lb./A were made. Soil surface was dry at this time, but a total of 1.4 inches of rain fell during the following 5 days. On May 17, when corn had 1-2 leaves and weeds were just beginning to emerge, spray applications were made of CDAA 2 and 4 lb./A and 2,4-D amine 1 and 2 lb./A. Just prior to application of herbicides on May 17, half of each plot was cultivated with a rotary hoe. This rotary hoe cultivation was repeated on May 21. On May 22, Karmex DL was applied at rates of 3 and 5 pints per acre in 20 gallons of water; corn was at 2-4 leaf stage and weeds were 2-3 leaves and smaller. The weed infestation in this test area was practically all green and yellow foxtail. All check plots were cultivated May 28, and all plots were cultivated June 6 and June 20. Results: Two cultivations with the rotary hoe, with or without herbicides gave practically complete control of annual weeds. This was evident both in early June when first evaluations were made, and in early September at the time of later evaluations. None of the herbicide treatments with no rotary hoe were equal to rotary hoe cultivation for weed control. CDAA 4 lb./A pre-emergence was nearly as effective as the rotary hoe, and 5 pints per acre of Karmex DL gave only moderate control of weeds. None of the other herbicide treatments gave effective control of annual grass weeds under the conditions of this experiment. (Iowa Agricultural Experiment Station, Ames, Iowa.)

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Flax

R. G. Robinson

Summary

TCA applied post-emergence generally gave good control of Setaria species without injuring flax. Dalapon at a rate of about 1 lb/A is promising as a lower cost treatment than TCA but more trials are needed before recommendation. CDAA at rates of 4 or 6 lb/A pre-emergence gave erratic control of Setaria and in one report moderately reduced flax stand. IPC pre- or post-emergence at rates up to 8 lb/A resulted in poor control of Setaria and one of the post-emergence 8 lb treatments injured flax. DCU at 16 lb/A post-emergence gave fair control of Setaria and no injury to flax. CMU post-emergence at 2 lb/A was less effective on Setaria than TCA at 3 lb/A, and neither product was injurious to flax.

CDAA pre-emergence or pre-planting gave fairly good results in controlling wild oats in flax. Most of these abstracts are published in the Annual and Winter Annual Grass Weeds section of this report.

For non-grass weed control in flax, comparisons of various formulations of 2,4-D, MCP, and the butyrics applied post-emergence are reported. 2,4-D paste was less injurious to flax than standard 2,4-D or MCP formulations, but its effect on weeds at these rates of application was not determined. The butyrics were safe to use on flax at rates recommended for 2,4-D or MCP but more information on weed control with these rates of application is needed.

High rates of 2,4-D, MCP, or TCA increased the percentage of wilted seedlings in flax according to one abstract, but whether the increase was due to F. lini, chemicals, or a combination of both was not determined.

Abstracts

Herbicides for control of weeds in linseed flax. Brown, D. A. Redwood flax was used. Herbicides were: 2,4-D butyl ester and alkanolamine salt; MCP butyl ester, amine and sodium salt; D1144 (an MCP propylene glycol butyl ester) HC-1281-AN. All at rates of 3, 6, and 8 oz/A. TCA and CMU were used to control green foxtail, the former at rates of 3 and 8 lb/A, the latter at 1 and 2 lb/A. In addition TCA was used at 3, 5, and 8 lb/A in combination with 5 oz/A of MCP amine, and CMU at 1, 1½ and 2 lb/A with the same rate of the MCP amine. All treatments were applied in a spray of 12 gal water per acre at two stages of growth; (1) when flax plants were 2 to 4 in high and weeds in early seedling stage; (2) when flax plants were 5 to 9 in tall and weeds in advanced seedling stages. Weed infestation was heavy consisting mainly of red root and lambsquarters pigweed, stinkweed, wild buckwheat, green foxtail and perennial sowthistle. Moist hot weather accompanied the spraying season. Results: The influence of stage of growth i.e., early seedling or bud, was barely noticeable in 1956. Averaging all treatments, crop treated at the early stage yielded 23.7 bu/A, that at the later stage 22.6 bu/A. At the early stage overall weed control averaging all treatments, was 53 percent, and, 56 at the later stage. Under rates of application grouping the 2,4-D's, Dow 1144 and HC-1281-AN showed an overall weed kill of 43, 52, and 65 percent respectively for the 3, 6 and 8 oz/A rates. Of the two grass killers TCA at 3 lb/A gave 74 percent control of green foxtail and 78 at the 8 lb/A rate. At 1 lb/A CMU gave 53 percent control and 68 at the 2 lb/A rate. Of the two coded compounds used, Dows 1144 gave results comparable with 2,4-D butyl ester, but, HC-1281-AN gave unsatisfactory weed control and severely injured the flax. In degree of injury to flax the treatments rated from

least to greatest damage as follows: TCA and CMU equal; MCP sodium salt; D1144, MCP ester and amine equal; CMU + MCP amine salt; 2,4-D amine; 2,4-D butyl ester and HC-1281-AN equal. Showing most injury was the combination of TCA and MCP amine. Overall weed control ratings for treatments other than TCA and CMU were from highest to lowest Dow 1144; TCA + MCP amine salt; 2,4-D and MCP esters equal; CMU + MCP amine salt; 2,4-D and MCP amine salts equal; MCP sodium salt and at the bottom HC-1281-AN. (Contribution from Experimental Farm, Brandon, Manitoba).

Green and yellow foxtail control in flax. Dunham, R. S., Soine, O. C., Thompson, J. R., Thompson, R. L., and Robinson, R. G. Flax was sprayed pre-emergence with 4 or 6 lb/A of CDAA or post-emergence with TCA at 5 lb/A, dalapon at 1 or 1½ lb, or dalapon plus wetting agent at ½ or 1 lb at Crookston, Waseca, and Morris. Non-grass weeds on all plots were controlled with MCP. Results: Foxtail control by CDAA was good at Morris and fair at Crookston. CDAA was not applied at Waseca. TCA gave good control at all locations. Best control at all locations resulted from dalapon at 1½ lb/A, but yields were less than from other treatments. Dalapon plus wetting agent at ½ lb/A gave fair control. Dalapon with or without wetting agent at the 1 lb rate gave slightly less control than TCA. Relative yields of treated plots varied widely between stations. None of the treatments reduced oil content and iodine number of the flax seed harvested from the plots. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3676, Sci. Jour. Series, Minn. Agric. Exp. Station).

Control of green foxtail (Setaria viridis) with TCA and dalapon. Keys, C. H. An area of fallow uniformly infested with green foxtail was sown to Dakota flax during the latter part of June. On July 11th when the flax was approximately three inches tall and the foxtail ranged from the seedling to five leaf stage, replicated, randomized plots 10' x 18' in size were treated with sodium TCA at 1, 2, 4, 6 and 8 lb/A and dalapon at ½, 1, 2 and 4 lb/A. Two untreated plots were included in the test as well. All chemicals were applied in water at 12 gal/A. With exception of the ½ lb/A rate of dalapon and 1 lb/A rate of TCA weed kills were excellent. The two low rates mentioned held weed growth down to where it did not interfere with the flax but stunted growth and small heads were noted in these plots. The heavier rates of dalapon tended to reduce yields of flax whereas TCA resulted in increased yields of flax. The average yields were as follows: (yield in bushels per acre in brackets) dalapon 1/2(13.9); 1 lb(13.5); 2 lb(11.6); 4 lb(10.7); check No. 1 (12.9); TCA 1 lb(14.7); 2 lb(16.2); 4 lb(15.0); 6 lb(14.5); 8 lb(15.3); Check No. 2(12.9). (Contribution from Experimental Farm, Scott, Sask.)

Influence of certain herbicides on disease development in flax and corn. Nair, P. N., Jordan, L. S., Dunham, R. S., and DeVay, J. E. Increased use of chemicals in recent years for controlling plant pests has in some instances increased the susceptibility of treated plants to certain diseases. Observations on the severity and prevalence of diseases in plots of corn and flax, which were treated with various chemicals for controlling weeds, indicated an increase in damage from certain diseases in comparison with control plots. Five varieties of flax were grown in the greenhouse and flax wilt nursery at St. Paul, Minnesota, in soil infested with Fusarium lini Bolley. When approximately 3 inches tall, these seedlings were sprayed with different concentrations of MCP, 2,4-D, or TCA. In the greenhouse 2,4-D and MCP at 6 and 8 oz/A and TCA at 9 lb/A significantly increased the percentage of wilted seedlings of the 5 varieties of flax. The effectiveness of 2,4-D and MCP in causing increased susceptibility of seedlings to wilt was greater at temperatures above 75°F but less than 95°F. Whether the increased amount of wilt in treated plots was due to F. lini, the applied chemicals, or a combination of both has not yet been determined. The test in the wilt nursery indicated a similar in-

crease in wilt susceptibility of flax seedlings treated with these chemicals; however, this increase in the percentage of wilted plants was not statistically significant. Corn plants in which the lower 3, 4, 5, or 6 leaves were sponged at layby with an aqueous solution of ATA (2 lb in 40 gal) were apparently more susceptible to bacterial rot of their brace roots than untreated plants. Chlorotic areas which developed in the leaves of treated plants rotted during periods of high humidity. (Contribution from the Department of Plant Pathology and Botany and the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3647, Sci. Jour. Series, Minn. Agric. Exp. Station).

Giant foxtail control in flax. Robinson, R. G., Jordan, L. S., and Dunham, R. S. Marine flax was sprayed 5 days after sowing with 4 or 6 lb/A of CDAA; or when the flax was 3 in tall and the foxtail 1 in tall with 5 lb/A of TCA, with dalapon at ½, 1 or 1½ lb/A, or with dalapon + wetting agent at ¼, ½, or 1 lb/A. The flax had just started to germinate when the CDAA was applied, but because of cold weather, emergence did not occur for 17 days. Non-grass weeds were controlled on all plots with MCP. Results: Under these conditions CDAA failed to control foxtail and reduced the stand of flax slightly at 4 lb and moderately at 6 lb. Dalapon at 1 or 1½ lb gave 100% control of foxtail. Dalapon with wetting agent at 1 lb or TCA gave almost 100% control. Other treatments gave excellent, but slightly less control. Dalapon at 1½ lb alone or 1 lb with wetting agent delayed flax maturity 2 days. Yields greater than those from the unsprayed plots resulted from TCA, dalapon at 1 lb or dalapon plus wetting agent at ¼, ½, or 1 lb. Although dalapon at 1½ lb controlled foxtail 100%, yield of flax was about the same as unsprayed. None of the treatments reduced oil content, iodine number, or germination of the flaxseed harvested from the plots. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3678, Sci. Jour. Series, Minn. Agric. Exp. Station).

Comparison of 2,4-D, MCP, 4-(2,4-DB) and 4-(MCPB) on weed-free flax. Robinson, R. G., Jordan, L. S., and Dunham, R. S. Marine flax was sprayed when 6 in tall with 2,4-D amine 3/8 lb/A; 2,4-D ester 3/16 lb; 2,4-D LV ester 3/16 lb; 2,4-D paste 3/8 lb; MCP amine 3/8 lb; 4-(2,4-DB) amine 3/8 lb; or 4-(MCPB) amine 3/8 lb. Weeds were removed by cultivation and by hand. Results: The 2,4-D paste had no effect on flax. Comparing MCP amine and 2,4-D amine, the MCP caused more stem bending and a greater delay in bloom. Comparing the two esters of 2,4-D, the ester caused more stem bending and a greater delay in bloom. Comparing the butyrics, the 2,4-DB caused slightly more bending and slightly greater delay in bloom. Comparing 2,4-D amine and 4-(2,4-DB), response of flax was essentially the same. Yields of seed or straw did not differ significantly, but MCP amine and 2,4-D ester resulted in lowest seed yields. MCP amine and 4-(2,4-DB) gave lowest straw yields. Oil content and iodine number were not affected by any treatment. Germination of the seed harvested from the plots was not affected except for a slight reduction by MCP amine. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3679, Sci. Jour. Series, Minn. Agric. Expt. Station).

Relative effect of pre-emergence treatments of IPC and CDAA on grassy weeds and broad-leaved crops, 1956. Selleck, G. W. and Coupland, R. T. Flax, Argentine rape, wild oats and green foxtail were seeded on May 8 in rows one ft apart at Saskatoon and treated with pre-emergence applications in triplicate with IPC at 2, 4 and 8 lb and CDAA at 3, 6 and 12 lb of active ingredient/A in 8.3 Imp. gal of water. Visual examinations made on June 27 indicated the relative percentage control to be as presented below (0 = no effect, 60 = satisfactory control of weeds, 100 = complete killing).

Species	Rate of herbicide per acre					
	IPC			CDAA		
	2 lb	4 lb	8 lb	3 lb	6 lb	12 lb
Flax	0	0	0	0	0	0
Rape	0	0	0	0	0	0
Wild oats	0	0	53	0	7	66
Green foxtail	23	10	10	7	76	86

Yield tests revealed no decrease in the yield of rape seed as a result of pre-emergence treatment with the herbicides. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.).

Relative effect of various herbicides on grassy weeds and broad-leaved crops, 1956. Selleck, G. W. and R. T. Coupland. Flax, rape, wild oats and green foxtail were seeded on May 8 in rows one ft apart at Saskatoon and treated with IPC at 2, 4 and 8 lb, TCA at 3, 6 and 12 lb, dalapon at 1½, 3 and 6 lb and DCU at 8, 16 and 32 lb of active ingredient/A. Triplicated treatments were made on June 13 (2 to 6 leaf stage) and July 4 (rape, wild oats and flax flowering, green foxtail 4 to 8 in tall). Visual examinations made June 27 indicated the relative percentage control to be as presented below (0 = no effect, 20 = moderate bending of terminal shoots, 60 = satisfactory control of weeds, 100 = complete killing) in the most susceptible (first) stage of treatment. Treatment at the second date caused more damage to flax and rape and had less effect on green foxtail and wild oats.

Species	Rate of herbicide per acre											
	IPC			TCA			Dalapon			DCU		
	2lb	4lb	8lb	3lb	6lb	12lb	1½lb	3lb	6lb	8lb	16lb	32lb
Flax	0	0	20	0	6	0	0	10	13	0	0	0
Rape	0	0	0	0	0	0	7	0	7	0	0	0
Wild oats	0	0	0	0	16	10	0	56	66	0	0	0
Green foxtail	13	13	23	66	75	90	76	83	73	43	60	56

Dalapon applied at the first and second dates decreased seed yields of rape 31% and 64% respectively, while DCU applied at the second date decreased rape seed yield by 33%. These decreases were significant beyond the 1% level. A 11.6% decrease in yield on plots treated with TCA was not statistically significant. Flax yields were not taken. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

Relative effect of formulations of 2,4-D and MCP on certain weeds and crop plants, 1956. Selleck, G. W. and R. T. Coupland. Hemp nettle, flax and oats (which had been planted in rows one ft apart on May 8) were treated at Saskatoon with the esters of 2,4-D and MCP at 4, 8 and 16 oz and the amine and sodium-potassium salt of MCP at 8 and 16 oz acid equivalent/A in 8.3 Imp. gal of water. Green smartweed (Polygonum scabrum) and red-root pigweed grew profusely in the plots. Triplicated treatments were applied June 25 and July 4. Visual examinations made in July indicated the relative percentage of control as shown below (0 = no control, 20 = terminal twisting of crop plants, 60 = satisfactory control of weeds, 100 =

complete killing). Relatively similar results were obtained from treatments in both stages, but a re-assessment in August revealed relatively less damage because of revival and further growth of the weeds. This revival would probably have been much diminished in competition with a good stand of grain.

Species	Rate of application of herbicide (oz/A)							
	MCP ester		2,4-D ester		Na-K salt of MCP		MCP amine	
	8	16	8	16	8	16	8	16
Green Smartweed	13	36	24	36	16	30	7	33
Red-root pigweed	0	10	10	30	0	20	0	0
Hemp nettle	31	61	29	35	36	58	33	61
Flax	3	0	24	26	0	7	0	7
Oats	0	0	0	0	0	0	0	0

Yield tests revealed no definite relationship between the yield of oats and rates of application of herbicides. Rating the yields of the check plots as 100, plots treated with MCP ester, MCP amine, MCP Na-K salt and 2,4-D ester yielded 100, 97, 94.5 and 92 respectively. Flax yields were not taken. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.).

<u>Comparison, 2,4-D and MCP when applied to weedy oats and flax fields, 1956.</u> Wood, H. E. and Craig, H. A. On 17 widely separated Manitoba farms 8 fields oats and 9 fields flax carrying average infestations of weeds common to the district had 5-acre blocks sprayed by the farmer as follows: Oats: 2,4-D ester 4 oz/A, 2,4-D amine 6 oz/A, MCP ester 6 oz/A; flax: treated respectively 3, 5 and 5 oz/A. Late spring and mid-summer inspections indicated: Flax treated with MCP showed either no or only slight, retardation in maturity and in height of stand, whereas the ester of 2,4-D caused considerable depression; the 2,4-D amine was intermediate in its effect. In the control of weeds the 2,4-D ester had the advantage of being effective on a wider range of species — all treatments were effective on easier to kill weed species when treated in the early growth stages; where weed growth was more advanced at time of application or harder to kill weeds were encountered the relatively low dosages of the 2,4-D amine and MCP were rather ineffective, whereas 2,4-D ester gave more control except on such weeds as wild buchwheat which requires a quite high dosage or repeat applications, to give a measure of control. A late and wet harvest prevented all cooperators from obtaining yield data. Data received failed to give a definite pattern of yields so is omitted. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada).

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SOYBEANS

Summary

F. W. Slife

Weeds are best controlled in soybeans by cultural practices, but several pre-emergence herbicides have performed consistently enough to be recommended in problem areas.

From the abstracts submitted this year, it appears that alpha chloro diallyl acetamide (CDAA) has been the most consistent pre-emergence herbicide used. Eight investigators reported good to excellent grass control and medium to poor broadleaf control with this compound. DNBP, CIPC, and NPA performed well in certain tests and not so well in others.

Three abstracts were submitted on the use of DNBP as an early post-emergence spray in soybeans. All three reported encouraging results of weed control and lack of injury to soybeans when this material was applied soon after the soybeans were coming through the ground.

Abstracts of Results of Cooperators

Grass weed control in soybeans at ten locations in Minnesota. Blanchard, K. L., Jordan, L. S., and Jensen, E. H. Pre-emergence applications of CDAA, NPA, and DNBP amine were made at 10 widely distributed locations in Minnesota. CDAA and NPA were applied at 4 lb./A and DNBP at 7 1/2 lb./A immediately after the soybeans were planted. One-acre plots were used. The predominant species were green and yellow foxtail.

Results: Successful weed control was obtained at all locations with CDAA, at five locations with NPA, and at one location with DNBP. No injury to the soybeans was observed from CDAA at any location. A reduction in vigor occurred at two locations from NPA and DNBP. These results could not be correlated with weather conditions, soil conditions, or time of application. (Minnesota State Department of Agriculture and the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3656, Sci. Jour. Series, Minn. Agr. Exp. Station)

Herbicides on soybeans. Bondarenko, D. D., Dowler, Clyde, and Willard, C. J. Harosoy soybeans were planted in 42-inch rows on June 8, 1956. German millet was sown to simulate annual grass weeds. All plots had a natural infestation of redroot pigweed; lambsquarters was present in the pre-emergence plots only. Triplicate 4-row plots were band-treated (20-22 inch bands) over the soybean rows with each rate of each herbicide.

The following were applied pre-emergence on June 8: Alpha-chloro-N,N-diallylacetamide (Randox) at 3, 6, and 9 lb./A; PGBE ester of 2,4-D at 1 1/2 lb./A; sodium N-1 naphthyl phthalamate (Alanap-3) at 2, 4, and 8 lb./A; isopropyl N-(3-chlorophenyl) carbamate (CIPC) at 4, 6, and 8 lb./A; Alanap-3 plus CIPC at 1 + 1, 2 + 2, and 3 + 3 lb./A; 2-chloro-4,6-bis(diethylamino)-s-triazine (Geigy 444E) at 6, 8, and 12 lb./A; 2-chloro-4,6,bis(ethylamino)-s-triazine (Geigy Simazin) at 2 and 4 lb./A, and compounds 5519 and 5521 (carbamates from Niagara Chem. Co.) at 8 and 12 lb./A.

Post-emergence herbicides consisted of alkanol amine salts of dinitro-o-sec-butylphenol (Premerge) at 3/4, 1 1/2, 2 1/4, and 3 lb./A applied at the cotyledon stage, when the first true leaves were fully expanded, and at the 2- to 4-leaves stage; 3-amino-1,2,4-triazole (Amizol) at 1/8, 1/2, and 1 lb./A at the cotyledon stage, and all the following at the 2- to 4-true leaves stage: alkanol amine salts of 2,4-D at 1/8 lb./A; dimethyl amine salt of 2-methyl-4-chlorophenoxybutyric acid (MCPB) at 1/2, 1, and 2 lb./A; dimethyl amine salt of 2,4-dichlorophenoxybutyric acid (2,4-DB) at 1/2, 1, and 2 lb./A; 2,4-DB (ester) and 2,4-DB (amine) each at 1 lb./A, and 2,4-DP ester (ACP-L-685) at 1/4, 1/2, and 1 lb./A.

All rates are in terms of active ingredient. All were applied in 40 gallons water per acre.

The pre-emergence herbicides that gave the most satisfactory results were CIPC at 8 lb./A, Randox at 9 lb./A (which also gave good control of millet at 3 and 6 lb./A but only fair control of broadleaves), and 2,4-D ester at 1 1/2 lb./A, which resulted in excellent control of broadleaves and good control of millet. Geigy 444E at 8 and 12 lb./A gave excellent control of broadleaves but only fair to poor control of millet; some slight injury to soybeans resulted at 12 pounds. Alanap-3 at 8 lb./A, and Alanap-3 plus CIPC each at 3 lb./A gave excellent control of millet, poor control of broadleaves. Compound 5519 at 12 lb./A gave fair control of weeds; 5521 was generally uneffective. Geigy Simazin was extremely injurious to the soybeans at each rate; the weed control was excellent at 4 pounds.

At the first true leaves stage, Premerge gave excellent results at 3 lb./A and good results at 1 1/2 and 2 1/4 lb./A, with apparently no lasting injury to the soybeans. Extensive injury to soybeans followed treatment at 2 1/4 and 3 lb./A at the 2- to 4-true leaves stage, but recovery was apparently complete and weed control was excellent. At the cotyledon stage, 3 lb./A of Premerge gave good weed control and 1 1/2 and 2 1/4 lb./A gave fair to good results, no soybean injury. Amizol and MCPB amine gave poor weed control at all rates, and both resulted in severe injury to the soybeans at the higher rates. 2,4-DB amine caused slight injury at 1 pound, severe at 2 pounds, with no control of millet at either rate but excellent control of redroot. 2,4-DB ester was much more injurious to the soybeans than 2,4-DB amine. ACP-L-685 gave no weed control but injured the soybeans slightly at 1/4 pound, severely at 1/2 and 1 pound. 2,4-D amine was ineffective at the rate used.

Another test with 2,4-DB, MCPB, and DNBP post-emergence on a midsummer planting of soybeans was almost destroyed by crusting following heavy showers, but 1 1/2, 2 1/4, and 3 lb./A of DNBP nearly completely killed the beans at 2- to 4-true leaves stage. A temperature of 97° was recorded two days after application and may have been the reason for the difference in the two tests. The MCPB and 2,4-DB had only slight effect on the millet, controlled purslane, and did not injure beans in this test. (Ohio Agricultural Experiment Station)

Herbicides for weed control in soybeans. Brown, D. A. The Acme variety was used in 1956. The experiment had two divisions: (1) band treatment with the seed and (2) post-emergence at 1- and 3-leaf stages. Band treatments included Alanap 3 (N-1 naphthyl phthalamic acid) at 3 and 6 lb./A. DNBP (4,6-dinitro ortho sec-butylphenol); Geigy 444E (2 chloro-4, 6-bis(diethylamine) S-triazine), CIPC (isopropyl N-(3-chlorophenyl) carbamate, and randox (2-chloro N-N-diallylacetamide), at 6 and 9 lb./A. Randox at 4 and 6 lb./A applied at the 1- and 3-leaf stages was the only post-emergence treatment used.

Results: Randox was the only band treatment that reduced the yield of threshed beans below the untreated check. The reduction was not significant. Rates gave no significant differences. Randox gave the most satisfactory weed control, closely followed by Geigy 444E. CIPC gave fair control only, while DNBP and Alanap 3 gave poor control. Following two inter-row cultivations, beans treated with Randox and Geigy 444E remained remarkably clean. Applications of 4 and 6 lb./A of Randox at the 1-leaf stage gave reasonably good control of weeds with no significant reduction in yield, but at the 3-leaf stage yield was significantly reduced and weed control was not satisfactory. Post-emergence treatment set the bean plants back severely, but the recovery was remarkable. (Experimental Farm, Brandon, Man.)

Effect of herbicides used pre-emergence for control of weeds in soybeans. Freeman, J. F. Clark soybeans were planted June 12 in Burgin silty clay loam soil at depths of 1 to 1.5 inches. Showers followed planting and the soybean plants and weed seedlings were about ready to emerge when spray treatments were applied June 16. DNBP at 5, 7, and 9 lb./A; NPA at 2, 4, and 6 lb./A; CIPC at 4, 6, and 8 lb./A; CDAA at 3, 4, and 6 lb./A; diuron at 0.5, 1, and 2 lb./A; neburon at 1, 2, and 4 lb./A; and 2,4,5-TES at 3 and 6 lb./A; and uncultivated and cultivated checks were the treatments used in a randomized block design with four replications. Each herbicide was applied in water spray at 32 gal./A. Pigweed, carpetweed, and crabgrass were the principal weeds. All plots, including uncultivated checks, were cultivated free of weeds July 11 after weed control ratings were made. Growing conditions were so favorable throughout the summer that early weed competition of the uncultivated check treatments prior to over-all cultivation caused no reduction in yield of beans (40.6 bu./A) compared to 39.3 bu./A for the early-cultivated checks.

CDAA gave good control of grasses, and 50% control of broadleaf weeds without injury to soybeans. The 6 lb. rate was slightly more effective than the lighter rates. NPA at 2 lb./A gave excellent control of all weeds without injury to the crop; but the 4 and 6 lb. rates resulted in somewhat poorer stands and lower yields of beans. DNBP at all rates gave good control of weeds, about 50% reduction in stand of beans, and some stunting especially at the 9 lb rate. At 5 lb./A, yield of beans was not affected, but at 7 and 9 lb./A yields were reduced. CIPC gave good weed control at all rates except on grasses at the lightest rate, slight reduction in stand, height, and yield of beans at 4 and 6 lb./A, but significant reduction in each at 8 lb./A. Neburon at all rates gave good weed control, little reduction in yield at 1 and 2 lb./A, and moderate reduction at 4 lb./A. Stand of beans was reduced some at 2 lb./A and more than 50% at the 4 lb./A. 2,4,5-TES at 3 lb./A gave excellent control of weeds and no reduction in yield of beans, although stand was reduced about 40% and early vigor and final height were reduced considerably. Complete or nearly complete stand failures resulted from its use at 6 lb./A. Diuron at 0.5 lb./A resulted in perfect weed control, 50% reduction in stand, and moderate reduction in yield of beans. At 2 lb./A, soybeans were killed, and at 1 lb./A the stand and vigor were so reduced that yield was very low.

In a similar test on Ohio River Overflow Soils in Union County, Kentucky, dry weather prevailed at time of and for several weeks following treatment, and little or no effect of herbicides could be seen on stand of weeds or soybeans one month after treatment. Heavy infestation of perennial vines and some broadleaf weeds prevailed. (Department of Agronomy, Kentucky Agricultural Experiment Station)

Control of early weeds in soybeans with DNBP applied as early post-emergence sprays. Kavanaugh, J. M., and Freeman, J. F. DNBP at 0.75, 1.50, 2.25, and 3 lb./A each was applied in water spray, 32 gal./A, on one set of plots June 18, 1956, when soybeans were at the crook stage of growth; on a second set of plots June 20, when the cotyledons had spread; on a third set June 27, when the first trifoliate leaves were expanded; and on a fourth set July 4, when the 3rd trifoliate leaves were partially expanded. Soybeans, Clark variety, had been planted June 12 on Maury silt loam soil at the rate of 3 pk./A in rows 3 feet apart. A mixture of pigweed, lambsquarters, smart weed, and giant ragweed seed was sown with a cultipacker seeder in 18-inch strips centered in the middles between plot rows after the soybeans were planted. The soil was naturally heavily infested with crabgrass, stink grass, and green and yellow foxtails. Rainy weather beginning two days after planting continued for six weeks.

Soybeans and weeds began emerging at about the same time, June 17. Two sets of unsprayed plots, one set cultivated and the other uncultivated, were included in the experiment, which was a randomized block design with four replications. Maximum temperatures (F.) at the four treatment dates were June 18, soil 80°, air, 87°; June 20, soil 81°, air, 83°; June 27, soil 93°, air 84°; and July 4, soil, 94°, air 92°. Number of weeds in five 1 sq. ft. quadrats in each plot were determined July 17, prior to clean cultivation of all plots July 20. Stand of soybean plants was determined at harvest time, October 1.

Under the conditions of this experiment, with soybeans and weeds emerging simultaneously, good weed control for one month resulted from all four rates of DNBP used at the crook stage of soybean growth and from all rates except the lowest applied at cotyledon stage. Inadequate weed control resulted from applications at the two later stages of growth, even though the weed stands were reduced considerably in comparison to those of the uncultivated check. Stands of soybeans were reduced seriously (about 50%) only at the 3 lb./A rate of DNBP used at crook stage. This reduction in stand lowered the yield of beans only slightly. Removal of weeds from all plots after a month permitted those which had heavy initial weed infestations to produce almost as large a yield of beans during the continued favorable moisture conditions as did those treatments where initial weed control was good. Leaf-burn of soybeans following treatment at the two later stages of growth apparently retarded growth and may have been responsible for reducing bean yields where the heavier rates were used. (Department of Agronomy, Kentucky Agricultural Experiment Station).

Evaluation of herbicides for weed control in soybeans. Klingman, D. L., and Kerr, H. D. Four replications of several herbicide treatments were applied as pre-emergence sprays on a planting of Clark soybeans at Columbia, Missouri, on May 11, 1956. The herbicides were applied in 40 gallons of water per acre. The entire experiment received three cultivations. Stand of soybeans in 9 feet of row and weed populations in 4.5 sq. ft. per plot were determined on June 21, 1956. Broad-leaved weed species were *Amaranthus* and *Acnida* spp., *Abutilon theophrasti*, and *Solanum carolinense*. Weed grasses were insignificant. The soybeans were harvested and yields were expressed as bushels per acre. BCPC at 12 lb., CIPC at 8 lb., and 2,4-DB ester at 1/2 lb. gave highly significant reductions of stand of soybeans. 2,4-DB ester was applied as a post-emergence treatment on soybeans 6 to 8 inches tall that had been treated earlier with 4 lb. CDAA, which gave no injury to soybean stand when used alone.

Of these chemicals, DNBP at 9 lb. promoted a significant yield increase over the check of 4.1 bushels. The treatment on the highest yielding plots was CDAA at 4 lb., which allowed a 5.4 bushel increase over the check plot. The highly significant difference in yield attained with 4 lb. of CDAA was the result of excellent weed control coupled with no bean injury. PCP (Na) at 20 lb. increased yields over the check by 3.9 bushels, with no apparent stand reduction, while highly significant weed control was attained with all the pre-emergence chemical treatments. (Field Crops Research Branch, ARS, U. S. Department of Agriculture and Missouri Agricultural Experiment Station cooperating)

Study of Interrelation of Cultivation and Band Applications of Herbicides for Weed Control in Soybeans. Larson, R. E., Klingman, D. L., and Kerr, H. D. A study was set up at two locations to determine the effectiveness of one, two, and three cultivations when used with four promising pre-emergence herbicides applied in band treatments to rowed soybeans. Clark soybeans were planted on a Putnam silt loam, and Perry soybeans were planted on a Wabash clay loam. The herbicides and rates were DNBP 7 1/2 lb., PCP(Na) 20 lb., CDAA 4 lb., and (1-chloropropyl-2) N (3-chlorophenyl) carbamate 10 lb. These herbicides were applied in 12-inch bands over the rows. The cultivation treatments on those plots receiving one and two cultivations were delayed so that the cultivations corresponded respectively to the third and the second and third cultivations on those plots receiving three treatments.

Yields on the Wabash clay loam area where weeds were not a problem show no significant differences between any of the chemical treatments and the unsprayed cultivated check. There was also no difference due to frequency of cultivation. On the Putnam silt loam area, where weeds (amaranthus and acnida species) were a problem, DNBP reduced the stand 75% and yields by 50% as compared to the unsprayed check. CDAA plots yielded 24.9 bu./A and the PCP(Na) 25.8 bu./A as compared to the unsprayed check average yield of 20.7 bu./A for the three levels of cultivation.

Three cultivations were significantly better than one cultivation at the 5% level. CDAA plus 3 cultivations and PCP(Na) plus 2 and 3 cultivations produced yields equal to or higher than the unsprayed check cultivated 3 times. (Farm Machinery Section, A.E.R.B., and Weed Investigation Section, F.C.R.B., A.R.S., U.S.D.A., Columbia, Missouri)

Giant foxtail control in soybeans. Robinson, R. G., Jordan, L. S. and Dunham, R. S. Ottawa Mandarin in non-cultivated rows 6 inches apart was sprayed pre-emergence 5 days after planting. Herbicides and rates in lb./A were: NPA, 4, 5, or 6; 3Y9, 2, 3, or 4; CDAA, 4, 5, or 6; CP 9802, 4, 5, or 6; neburon, 2 or 4.

Results: No treatment, including cultivation of check plots planted in rows 40 inches apart, resulted in satisfactory control of the foxtail. CDAA, however, at 5 or 6 lb. gave better control than any other herbicide or cultivation, and the soybeans yielded significantly more. These plots were heavily and uniformly infested with foxtail. (Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3651, Sci. Jour. Series, Minn. Agr. Exp. Station)

Green and yellow foxtail control in soybeans. Robinson, R. G., Thompson, R. L., Thompson, J. R., Soine, O. C., and Dunham, R. S. Soybeans at Sleepy Eye, Morris, Waseca, and Crookston were sprayed pre-emergence with the following herbicides and rates in lb./A: CDAA, 4, 5, or 6; NPA, 4, 5, or 6; and neburon, 2 or 4.

Results: CDAA gave good control of the foxtail at all four locations. NPA gave erratic control and neburon poor control. (Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3653, Sci. Jour. Series, Minn. Agr. Exp. Station)

Pre-emergence treatment of weeds in soybeans. Rogers, B. J., Hart, R. D., and Ingle, M. Soybeans were planted on May 18, 1956, in a Chalmers silty clay loam just north of Lafayette, Indiana. At the same time oats were drilled in and rape was broadcast sown. On May 19 the plots were sprayed with 2 and 4 lb./A of alpha-chloro-N,N-diallylacetamide (CDAA): 4 and 6 lb./A of NP, sodium salt (Alanap 3); 2 lb./A of tris-(2,4-dichlorophenoxyethyl) phosphite (3Y9); and 4 and 6 lb./A of CIPC. Major broadleaved weeds in the field were Mollugo verticillata, Ambrosia artemisiifolia, Sida spinosa, and the sown rape. Major grasses in the field were Setaria sp. and the sown oats.

CDAA at 4 lb./A controlled the oats and gave 75% control of the foxtails; at 2 lb./A there was 50% control of the oats and 75% control of the foxtails. NP at both rates gave about 50% control of both broadleaves and grasses. Mollugo was completely controlled. 3Y9 at 2 lb./A gave excellent control of all but the oats. The soybeans were damaged severely. CIPC at 4 and 6 lb./A gave 60-75% control of broadleaves (except ragweed) and grasses. At 6 lb. the soybeans were somewhat stunted. (Department of Botany and Plant Pathology, Purdue University Agricultural Experiment Station, Lafayette, Indiana)

Effect of dinitro ortho secondary butyl phenol on soybeans applied as a post-emergence spray. Slife, F. W. Hawkeye soybeans planted May 25, 1956, were treated at two stages of growth with varying rates of the amine salt of DNBP. Rates used were 3/4, 1 1/2, 2 1/4, and 3 lb. of DNBP acid per acre. Chemicals were applied in a total solution of 20 gallons per acre. Applications were made when the soybean cotyledons were unfolded and again to new plots when the first trifoliate leaf was expanded. Exceptionally good control resulted from the first application date when the weeds were just coming through the ground. The 3/4 lb. rate reduced the weed population 40%; 1 1/2 lb. rate, 75%; 2 1/4 lb. rate, 100%; and 3 lb. rate, 100%. The second application was less effective in controlling weeds but was still exceptionally good. The 3/4 lb. rate reduced the weed population 10%; 1 1/2 lb. rate, 40%; 2 1/4 lb. rate, 85%; and 3 lb. rate, 100%. At the second treatment date weeds had developed to the 2- to 3-leaf stage of growth. Temperatures during this test were approximately 90° F.

Some leaf burning was noticeable on the soybeans at the 3 lb. rate at the first treatment date, and rather severe leaf burn at the second treatment date at both higher rates of DNBP. These burning effects disappeared quickly and were not indicated in yields. Figures indicate that yields were not reduced from the chemical treatment and were higher than those of the untreated plots. (Department of Agronomy, Illinois Agricultural Experiment Station)

Forage Legumes

Paul F. Sand

Summary

Nineteen abstracts on forage legumes were received from eight locations. A widespread interest in the butyric acids is indicated by the fact that thirteen of the abstracts submitted contain information on these chemicals.

Dalapon at rates of 2 and 4 lb per acre and TCA at 5 to 8 lb per acre gave good results in eliminating grassy weeds from seedling stands of alfalfa, birdsfoot trefoil and sweetclover. Some investigators reported that dalapon and TCA caused some temporary retarding of growth of these legumes but recovery was complete later in the season. In some cases the 4 lb per acre rate of dalapon caused a slight reduction in alfalfa stands. Giant foxtail was successfully killed in an established stand of alfalfa by 2 lb per acre of dalapon and 5 lb per acre of TCA when these chemicals were applied after the first cutting of hay.

The phenoxybutyric acids have given outstanding results controlling broadleaf weeds in alfalfa, red clover, sweetclover, birdsfoot trefoil and alsike clover with little or no injury to the legumes. Several investigators reported that 4-(2,4-DB) was less toxic to legumes than 4-(MCPB). The esters of these materials are somewhat more effective on weeds than the amine formulations.

Weeds controlled by 1 to 2 lb per acre of the phenoxybutyric acids are Russian thistle (Salsola kali), kochia (Kochia scoparia), lambsquarters (Chenopodium album), pigweed (Amaranthus retroflexus), purslane (Portulaca oleracea), and ladysthumb (Polygonum persicaria). The top growth of Canada thistle plants was also killed.

Abstracts

Herbicidal control of weeds in newly seeded stands of alfalfa and sweetclover. Brown, D. A. Grimm strain alfalfa and white blossom clover were underseeded with wheat. Herbicides used were: 2,4-D and MCP butyl esters at 2 and 4 oz per acre; 2,4-D and MCP amine salts at 3 and 5 oz per acre; 4-(2,4-DB) and 4-(MCPB) (Tropotex) at 4 and 8 oz per acre. Applications were made at two stages of growth (1) legume seedlings 1 1/2 inches and weeds in early seedling stages, (2) legume seedlings 4 inches and weeds in late seedling stages. Wheat was 6 inches tall at stage 1 and 10 inches at stage 2. Weeds prevalent: red root pigweed (thick) lambsquarters, grey tansy mustard, stinkweed, wild buckwheat, pepper grass, shepherd's purse and flat spurge. Results: ALFALFA. Stage of growth showed no significant differences in 1956. Rates of application gave wide differences. Averaging all treatments the low rates gave a percent weed kill of 54 compared with 72 at the high rates. At the low rates alfalfa survival was 69 percent compared with 61 at the high rates. Kinds of treatment revealed that 2,4-D ester at 4 oz per acre gave the best weed control (83%) and the lowest survival of alfalfa (40%). The least damage to alfalfa was from 4-(MCPB) at 4 oz per acre. Satisfactory weed control was obtained only at the higher rate of each treatment. Survival of alfalfa was good except at the 4 oz per acre rate of 2,4-D and MCP butyl esters. Sweetclover. Stage of growth produced no significant differences in 1956. High rates of each chemical gave significantly better control of weeds than the low rates but only 2,4-D butyl ester at the 4 oz per acre rate seriously reduced the stand of clover. In overall weed control treatments graded from highest to lowest as follows: 2,4-D ester; 2,4-D amine; MCP ester; MCP amine; 4-(MCPB) and 4-(2,4-DB). Effect on sweetclover from least to greatest were: 4-(MCPB); 4-(2,4-DB); MCP amine; 2,4-D amine; MCP butyl ester and 2,4-D butyl ester.

For the second year in succession sweetclover survived the chemicals better than alfalfa. In general, degree of weed kill parallels degree of injury to the legumes. The newer butyric acid formulae were least harsh on the legumes but gave the poorest weed kill. Rates of at least 8 oz per acre appeared necessary for satisfactory results. (Contribution from Experimental Farm, Brandon, Manitoba.)

Broadleaf and grassy weed control in seedling alfalfa. Bush, D. A. Spring seeded alfalfa in an oat nurse crop was treated 3 weeks after emergence of the alfalfa. At the treating date, May 22, 1956, the oat crop was in the 4 leaf stage of growth, and the alfalfa 2 or 3 inches tall. The plots were heavily infested with the broadleaf weeds Russian thistle (Salsola kali) and kochia (Kochia scoparia), along with some lambsquarters (Chenopodium album), pigweed (Amaranthus retroflexus) and buffalo bur (Solanum rostratum). The grassy weeds consisted of foxtails and downy bromegrass. Triplicate square rod plots were treated with dalapon (2,2-dichloropropionic acid) at the rate of 1 and 2 lb per acre; TCA at the rate of 5 lb per acre; dalapon at 1 lb plus 1/3 lb 4-(2,4-DB) (4-(2,4-dichlorophenoxy) butyric acid) per acre; 2 lb dalapon plus 1/2 lb 4-(2,4-DB) per acre; and 2 lb dalapon plus 1 lb 4-(2,4-DB) per acre. All treatments were calculated on lb of active ingredient per acre and applied with a hand sprayer in 40 gpa. water. Observations were made 3 weeks after treatment date, before the plots were destroyed by dry weather and grasshoppers, indicated the following results: 1 lb of dalapon per acre showed some oat damage and gave only fair control of the grassy weeds; 2 lb of dalapon per acre caused severe oat damage and eliminated all grassy weeds with the exception of a few scattered plants; 1 lb of dalapon plus 1/3 lb 4-(2,4-DB) per acre showed some oat damage, fair grassy weed control and a marked response on the Russian thistle, kochia, lambsquarters and pigweed; 2 lb of dalapon plus 1/2 lb 4-(2,4-DB) showed severe oat damage, excellent grassy weed control and good control of all broadleaf weeds with the exception of buffalo bur; 2 lbs of dalapon plus 1 lb 4-(2,4-DB) per acre showed severe oat damage, excellent grassy weed control and eliminated all broadleaf weeds along with a marked response on the buffalo bur; TCA at 5 lb per acre rate gave excellent grassy weed control with no apparent damage to the oats. (Contribution of the Division of Noxious Weeds, Nebraska Department of Agriculture and Inspection, Lincoln, Nebraska.)

Sweetclover control in red clover. Churchill, Boyd R. A mixture of mammoth red clover and sweetclover seeded on April 15 was sprayed with MCP amine 1/2 lb per acre acid equivalent five weeks after seeding. Plots were also sprayed one year (May 2) after seeding with MCP amine 1/2 and 1 lb and 2,4-D amine at 1 lb per acre. Sweetclover was controlled 91% when the MCP was applied 5 weeks after seeding. Other treatments were applied too late to be effective on fall seeded plots spraying the following spring (May 2) gave over 90% control of sweetclover for each treatment. Yields of plots was not effected significantly by the MCP at either rate but 2,4-D reduced hay yields 37% on spring seedings and 52% on fall seedings. (Contribution of the Michigan Experiment Station.)

Effect of MCP and 2,4-D upon yield and botanical composition of a hay mixture. Churchill, Boyd R. A mixture of Ranger alfalfa and Pennscott red clover (50% of each) was seeded April 15 with Mackson oats. Plots were sprayed 5 weeks later with 1/2 pound acid equivalent per acre of MCP amine and 2,4-D amine. Oats yields for both treatments were approximately 15% higher than for untreated plots. The following spring (1956) botanical analyses of the first cutting of hay showed 37%, 35% and 18% of alfalfa in the mixture for MCP, check and 2,4-D respectively. Hay yields were not significantly effected by the treatments even though the botanical composition had been changed. (Contribution of the Michigan Experiment Station.)

Phenoxybutyric acid compounds on young alfalfa. Dowler, Clyde and Willard, C. J. Ranger alfalfa was band-seeded at 15 lb per acre, June 8, 1956. Diethylamine formulations of 4-(MCPB) and 4-(2,4-DB) were sprayed on 6 x 20 ft plots at the rate of 1/4, 1/2, 1 and 2 lb per acre in duplicate, June 28 when the alfalfa was in the 2 to 4 true leaf stage. Pennsylvania smartweed, ladysthumb, lambsquarters, Canada thistle, purslane and red root pigweed were present. On July 18 alfalfa showed little if any injury from the herbicides. All the weeds present were killed (tops, on Canada thistle - effect on roots not yet known) by the herbicides with 2 lb per acre giving nearly complete control. (Contribution of the Ohio Agricultural Experiment Station.)

Phenoxybutyric acid compounds on birdsfoot trefoil. Dowler, Clyde and Willard, C. J. Empire birdsfoot trefoil was band-seeded at 8 pounds per acre on April 17, 1956. On June 26 diethylamine formulations of 4-(MCPB) and 4-(2,4-DB) were applied on 6 x 15 ft plots, replicated four times, at 1/2, 1, 2, 3 and 4 lb per acre. Canada thistle, lambsquarters, Pennsylvania smartweed and ladysthumb formed a two foot canopy, which prevented a good coverage of the plots and also protected the birdsfoot trefoil. 4-(2,4-DB) killed more of the weeds and less of the trefoil than 4-(MCPB). The 4 lb per acre rate of both herbicides was the most effective. At least 65% of the lambsquarters was killed by 1/2 lb per acre of both chemicals. Over half of the Canada thistle tops were killed, but the effect on the roots is not known Some of the ladysthumb and Pennsylvania smartweed were killed, with 4 lb per acre of both herbicides killing 75% or more. Observations on Sept. 24, following early August clipping, indicated 4-(MCPB) was more injurious to the trefoil than 4-(2,4-DB). The 3 and 4 lb per acre rates reduced the trefoil stand by 70%. Comparisons of ester and amine formulations of 4-(MCPB) and 4-(2,4-DB) indicated that the ester formulations affected both the weeds and trefoil more than the amines. (Contribution of the Ohio Agricultural Experiment Station.)

Herbicides on summer seeding of alfalfa. Dowler, Clyde and Willard, C. J. Alfalfa was band-seeded at 12 lb per acre on July 24, 1956 and German millet was broadcast over the area. Purslane, pigweed, lambsquarters, and stinkgrass were present. Triplicate 6 x 30 ft plots were sprayed at three stages of alfalfa growth: stage A, pre-emergence; stage B, 2 true leaves; stage C, 6-8 true leaves. Diethylamine formulations of 4-(MCPB) and 4-(2,4-DB) were applied at 1/4, 1/2, 1, 2 and 4 lb per acre in stages A and B and at 1/2, 1 and 2 lb per acre in stage C. Ester formulations were also applied in stage B. Neburon was applied at 1/2, 1, and 2 lb per acre in stages A and C. Dalapon was applied at 1, 2 and 4 lb per acre in stage B and in mixtures with 4-(MCPB) and 4-(2,4-DB) in stages B and C. DNBP was applied at 2 lb per acre in stages B and C. On Sept. 12 neburon was ineffective and pre-emergence spraying with 4-(MCPB) and 4-(2,4-DB) was unsatisfactory. Both 4-(MCPB) and 4-(2,4-DB) were very effective on the broadleaf weeds at 2 and 4 lb per acre in stage B. They also showed some activity on the grasses at this stage of growth, preventing the development of roots. Alfalfa was not affected by these chemicals. Both ester formulations were generally more effective than the amines. Mixtures of dalapon with 4-(MCPB) and 4-(2,4-DB) were very effective in controlling all weeds with little effect on the alfalfa. The most effective rate of this mixture was dalapon at 4 lb per acre and the phenoxybutyrics at 1 lb per acre. Dalapon alone gave good control of grasses and reduced the alfalfa stand somewhat but there was no visible reduction in stand where dalapon was mixed with the phenoxybutyrics. DNBP gave good control of all weeds and did not harm the alfalfa. The results at stage C were about the same as stage B. The herbicides were somewhat less effective because of the larger size of the plants. (Contribution of the Ohio Agricultural Experiment Station.)

Effect of three herbicides on spring planted alfalfa and sweetclover. Elder, W. C. Alfalfa and sweetclover were seeded on March 24 in 1 ft width rows, without a nurse crop in separate blocks. The chemicals were applied in 40 gallons of water per acre immediately after planting as pre-emergence treatments. Second treatments were made when the legumes were 1-2 inches high, and again when sweetclover was 8-10 inches and alfalfa 4-6 inches tall. The alfalfa was damaged by insects. Chemicals and rates used in lb of acid per acre for all treatments were 4 and 8 lb TCA per acre, 2 and 4 lb dalapon per acre (trichloropropionic acid) and 4 lb CDAA per acre (alpha-chloro-dialbyl-acetamide). Only a few grass weeds emerged in the plots, but pigweeds were numerous. In this test, time of treatments was not a factor in the amount of damage to the legumes. CDAA caused some burning on the outer edges of the leaves. Four lb dalapon per acre caused leaf curl. Eight lb TCA per acre injured the legume no more than 2 lb dalapon per acre. It appeared that sweetclover was injured less than alfalfa by the chemicals, but insect injury was severe in the alfalfa seedlings. Although the legumes showed some degree of injury soon after treatments, they soon recovered and were equal to growth in the check plots during the favorable growing season. Severe drought during the summer killed all the legume plants. Legumes in the treated plots were killed first. CDAA destroyed little grass weeds and no pigweeds. TCA and dalapon killed all grasses with the higher rates but few pigweeds, except from the pre-emergence treatment. (Contribution of the Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma.)

Response of seedling red clover and pigweed to 2,4-D, 4-(2,4-DB), MCPA, and 4-(MCPB). Freeman, J. F. and Taylor, N. L. Kenland red clover was sown April 25, 1956 on a prepared seedbed of Maury silt loam soil. The soil was heavily infested with pigweed (Amaranthus retroflexus) and crabgrass (Digitaria Spp.). The experiment was a split-split plot design with 4 replications. The first clover seedlings emerged April 30. Amine formulations of 2,4-D, 4-(2,4-DB), MCPA, and 4-(MCPB), each at 1/4, 1/2, 1 and 2 lb per acre were applied as first treatment on one set of plots May 19 as the second trefoliate leaves of clover were unfolding and as second treatment on a second set June 2. Spray volume was 19 gallons per acre. Pigweed and red clover plants were counted and visual ratings of vigor reduction of clover plants were made June 18 and 19. Clover stands were again determined August 14 on regrowth after first cutting hay was removed. Results: The butyric materials were less toxic to seedling plants of red clover than were the acetic compounds. 2,4-D was the most toxic to red clover and to pigweed. 4-(2,4-DB) appeared to be more toxic to pigweed and less toxic to red clover seedlings than either MCPA or 4-(MCPB). Even the higher rates of 4-(2,4-DB) did not materially affect the stand of red clover, although, the vigor of the clover was reduced somewhat. This reduction in plant vigor was not apparent in regrowth of plants after cutting in August. Except for 2,4-D, differences in stand due to chemical treatments had largely disappeared by August 14. (Agronomy Department, Kentucky Agricultural Experiment Station.)

Post-emergence application of 4-(3,4-dichlorophenoxy) butyric acid, 4-(2,4-DB), as an iso-octyl in 1956 at Browns Valley, Minn. to control broadleaf annuals in small grain and flax underseeded with legumes. MacDonald, W. P., Zinter, C. C., and Slough, A. T. Applications of 1/4 lb acid equiv. per acre of 4-(2,4-DB), 2,4-D and MCPA were made on 3 fields of underseeded alfalfa and one of clover; legume 1-3 inches; nurse crop 3-10 inches in ht.; weeds were mustard, lambsquarter and pigweed; plots triplicated. Visual comparisons of 3 chemicals 24 hours and 3 weeks after treatment indicated weed control with all chemicals in proportion to injury or stunting of legume, with the least injury of legume and control of weeds by 4-(2,4-DB), MCPA and 2,4-D in that order. Stand counts planned in 1957. (Contribution of F. H. Peavey and Company, Minneapolis, Minn.)

Effect of substituted phenoxy acetic and butyric acids on seedling alfalfa, annual grasses and broadleaved weeds. McCarty, M. K. and Sand, P. F. Ranger alfalfa was seeded on April 18, 1956. Treatments were replicated four times. Emergence and growth were slow because of low soil moisture so that by the treatment date, June 1, the alfalfa was only 4 inches tall. The main weeds were kochia and pigweed with scattered patches of annual smartweed. Evaluation of the treatments was made by counting the number of alfalfa and broadleaved weed stems in five 2 x 4 ft quadrats per plot about 4 weeks after treatment. Due to no apparent effect on the grass population, counts of grass weeds were made only in the third quadrat of each plot. Quadrats were clipped at the bud stage of the alfalfa, and the plants were hand separated into the three types of material and oven dried.

Treatment	Rate : lb/A	Alfalfa Count(1)	Alfalfa Yield(2)	Grass Weeds Count(3)	Grass Weeds Yield(2)	Broadleaved Weeds Live(1) Count	Broadleaved Weeds Dead (1) Count	Broadleaved Weeds Yield(2)
4-(2,4-DB) Amine	1/2	1008	495**	38	855	56**	29*	264**
4-(2,4-DB) Amine	1	969	492**	59	1182	23**	48**	78**
4-(2,4-DB) Ester	1/2	988	525**	70	999	72**	36*	240**
4-(2,4-DB) Ester	1	950	387**	66	1107	20**	64**	81**
4-(MCPB) Ester	1/2	817	333	41	981	73**	1	648**
4-(MCPB) Ester	1	718*	285	60	816	76*	14	518**
2,4-D Amine	1/2	746*	228	42	1002	76*	6	537**
2,4-D Amine	1	295**	57**	48	1197	48**	46**	57**
Check		892	288	42	555	140	0	2023

(1) Average number of stems in 40 sq ft.
(2) Yield in lb dry matter per acre. Harvest made at early bud stage of alfalfa.
(3) Average number of grass plants in 8 sq ft. The grass was counted in only the third quadrat in each plot.

* Difference from check exceeds 5% level of significance.
** Difference from check exceeds 1% level of significance.

Stem counts where the alfalfa had been treated with either 4-(2,4-DB) amine or ester were higher than the check but the differences were not statistically significant. However, the 1 lb rate of 4-(MCPB) ester and both rates of 2,4-D showed marked reduction in stand. It was observed that the 1 lb rate of 4-(2,4-DB) ester caused slight stem curvature of the alfalfa but the effect was outgrown. Although there was no effect on number of grass plants, yield of the grass weeds increased with increased broadleaved weed control. Where the best broadleaf weed control was obtained, grass weed production was approximately twice that of the check. Weed counts are not as reliable an indication of the degree of control as the yield data. The 1 lb treatment of 4-(2,4-DB) showed only about 4% as much dry matter yield of weeds as the check. (Contribution of the Field Crops Research Branch, ARS and Agronomy Department, College of Agriculture, and the Nebraska Experiment Station cooperating.)

Control of grass weeds in spring seeded alfalfa. McCarty, M. K. and Sand, P. F. Ranger alfalfa was seeded on April 18, 1956 and treated at three stages of development with three chemicals. Seeding rate was 10 lb per acre with an additional 10 percent of weed seed which was predominantly green and yellow foxtail. Chemicals used were: trichloroacetic acid (TCA) at 5 and 7 lb per acre, 2,2 dichloropropionic acid (dalapon at 1,2 and 4 lb per acre and 2,2,3 trichloropropionic acid (2,2,3-TPA)

at 1, 2 and 4 lb per acre. At the first treatment stage (emergence) the alfalfa varied from cotyledon to first leaf stage of development with the grasses showing 2 leaves and about 1/2 inch tall. One week after emergence the alfalfa had 2 to 3 trifoliate leaves, grass weeds were about 2 inches high and broadleaved weeds were 1-2 inches tall. At the 4 weeks after emergence treatment the alfalfa was 3 to 5 inches tall, the foxtail was beginning to tiller and was 4-5 inches high with the broadleaved weeds from 4 to 6 inches tall. Quadrat clippings were made from each plot the second week in July and the harvested material was hand separated into alfalfa, grass and broadleaved weeds. After oven-drying the yields were computed to lb per acre.

At the emergence treatment date there was no damage to the alfalfa seedlings by any of the treatments. At the two later dates the heavier rate of TCA and the 4 lb rate of dalapon and 2,2,3-TPA gave some evidence of damage. This was observed to be largely tip browning and leaf burn. The tip damage resulted in stunted appearing plants with less volume of growth at clipping time. However, the regrowth was apparently normal. No loss of stand was observed. The following table gives the yield of the grasses as affected by the chemical treatments.

Pounds per acre of oven-dry material harvested in July.

Treatment	Rate lb/Acre	Emergence	1 week after Emergence	4 weeks after Emergence	Average
TCA	5	39	15	78	44☆☆
	7	27	27	33	29☆☆
Dalapon	1	102	129	78	103☆☆
	2	60	15	81	52☆☆
	4	18	6	39	21☆☆
2,2,3-TPA	1	1035	834	192	687☆☆
	2	297	234	74	202☆☆
	4	117	66	27	70☆☆
Check		1041	981	714	912

S. E. of mean difference for treatment = 71.
☆ Difference from check exceeds .05 level of significance.
☆☆ Difference from check exceeds .01 level of significance.

(Contribution of the Field Crops Research Branch, ARS, USDA and Agronomy Department, College of Agriculture, and the Nebraska Agricultural Experiment Station cooperating.)

<u>Permanent pasture renovation with dalapon and amino triazole - 1956</u>. Parsons, J. L. Experiments were conducted at two locations to determine: (1) How soon after chemical application can birdsfoot trefoil be seeded. (2) At what rate should the chemical be applied. <u>Treatments</u>: Dalapon 6 and 12 lb per acre and ATA 4 and 8 lb per acre acid equivalent were applied in April. A disk was the only tillage implement used after each treatment. Plots were bandseeded with Imported birdsfoot trefoil 8 lb per acre with 500 lb per acre of 0-20-0.

Number of birdsfoot trefoil plants per square foot 4-6 weeks after seeding.

Treatment lb/A acid equivalent	Southeastern Ohio[1] Interval * 5	10	15	Avg.	Wooster, Ohio[2] Interval * 7	14	Avg.
Dalapon 6	7.6	8.0	9.7	8.4	24.0	16.7	20.3
" 12	7.5	8.2	8.5	8.0	26.3	23.3	24.8
Avg.	7.5	8.1	9.1	8.2	25.2	20.0	22.5
ATA 4	2.8	2.2	4.0	3.0	9.4	7.0	8.2
" 8	1.1	1.0	1.7	1.3	3.4	2.2	2.8
Avg.	1.9	1.6	2.8	2.1	6.4	4.6	5.5
Grand Avg.	4.7	4.8	5.9	5.1	15.8	12.3	14.0
L.S.D. between chemicals at 5%				4.9			6.1
" " dates				N.S.			2.4
" " rates within chemicals				N.S.			3.4

* Number of days between spraying and seeding.
1; 4 replications. 2; 3 replications.

Conclusions: Satisfactory stands of trefoil were established by seeding as few as five days after spraying with 6 lb per acre of dalapon. The toxic effect of ATA did not disappear in 15 days with the lowest rate. Field tests indicated that the toxicity of ATA to trefoil was eliminated by plowing or by fall spraying followed by spring seeding. (Ohio Agricultural Experiment Station.)

Control of grass weeds and broadleaved weeds in spring seeded sweetclover and birdsfoot trefoil. Plucknett, D. L. Sweetclover and birdsfoot trefoil were planted April 20, 1956 and treated at three different dates with four chemicals. Seeding rate was 10 lb per acre. Chemicals used were: 2,2-dichloropropionic acid (dalapon) at 2, 4 and 8 lb per acre, trichloroacetic acid (TCA) at 5 and 7 lb per acre, 2,2-3-trichloropropionic acid (2,2,3-TPA) at 4 and 8 lb per acre, a mixture of 1/2 lb of 4-(2,4-dichlorophenoxy)-butyric acid 4-(2,4-DB) and 1 lb of dalapon, and a mixture of 1 lb 4-(2,4-DB) and 2 lb of dalapon per acre. At the first treatment date (emergence legume seedlings were just forming the first true leaf, grasses had two leaves and broadleaved weeds were at the two leaf stage. One week after emergence legumes had 1-2 trifoliate leaves, grasses were about 2 inches high and broadleaved weeds 1-2 inches high. Three weeks after emergence legumes were 3-5 inches high, grasses about 6 inches and broadleaved weeds 3-6 inches high. One 2 x 4 ft quadrat was clipped from each plot starting in late June and continuing through July. Hand separations were made of legumes, grasses and broadleaved weeds, and oven-dry yields of each were computed on a lb per acre basis.

Birdsfoot trefoil showed some slight injury on the emergence treatment with the higher rates of chemicals, however, all plants recovered. Sweetclover showed evidences of injury at all three dates by 8 lb of dalapon, 8 lb 2,2,3-TPA, and the mixture of 1 lb 4-(2,4-DB) and 2 lb dalapon. The mixture reduced the stand and top growth of sweetclover at clipping time.

Pounds per acre of oven-dry grass harvested in July in sweetclover plots.

Treatment	Rate lb/acre	Emergence	1 week after emergence	3 weeks after emergence	Average
TCA	5	834	342	639	605**
	7	384	288	870	514**
Dalapon	2	762	549	297	536**
	4	261	81	216	153**
	8	163	6	93	87**
2,2,3-TPA	4	916	591	555	687**
	8	753	180	384	439**
Mixture, 4-(2,4-DB)	½	1155	1650	1233	1346
Dalapon	1				
Mixture, 4-(2,4-DB)	1	993	1398	1215	1202**
Dalapon	2				
Check		1419	1964	2049	1811

** Difference from check exceeds .01 level of significance.

Pounds per acre of oven-dry grass harvested in July in birdsfoot trefoil plots.

Treatment	Rate lb/acre	Emergence	1 week after emergence	3 weeks after emergence	Average
TCA	5	735	543	1899	1059**
	7	975	612	1305	984**
Dalapon	2	813	1263	1329	1135*
	4	882	273	486	547**
	8	216	48	267	177**
2,2,3-TPA	4	588	1055	2199	1281*
	8	837	894	1317	1016**
Mixture, 4-(2,4-DB)	½	2085	2064	2703	2284
Dalapon	1				
Mixture, 4-(2,4-DB)	1	1047	1602	1533	1394*
Dalapon	2				
Check		1659	1812	3711	2394

* Difference from check exceeds .05 level of significance.
** Difference from check exceeds .01 level of significance.

(Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

The effect of chlorinated phenoxy-acetic and phenoxy-butyric compounds on weedy, spring seeded red clover. Plucknett, D. L. Red Clover was planted April 19 1956 at the rate of 10 lb per acre. Foxtail seed was planted with the red clover at 2 lb per acre. Chemical treatments were applied June 13 at rates of 1/2 and 1 lb per acre. Chemicals used were: ester and amine formulations of 4-(2,4-dichlorophenoxy)-butyric acid 4-(2,4-DB), 4-(2-methyl-4-chlorophenoxy)-butyric ester 4-(MCPB) and the amine salt of 2,4-D. The chemicals were applied in water at a volume of 40 gallons per acre. At time of treatment red clover was 5-6 inches high, grass 7-8 inches high, and broadleaved weeds 10-18 inches high.

Quadrat clippings were taken from each plot 6 weeks after treatment. Plants were hand separated into broadleaved weeds, grasses and red clover. Grasses were not kept for analysis. After oven-drying, yields were converted to pounds dry matter per acre.

The effect of various chemical treatments on yields of red clover and broadleaved weeds, expressed in average weight in lb per acre of four replications.

Treatment	Rate lb/acre	Yield in pounds per acre Red Clover	Broadleaved weeds
4-(2,4-DB) ester	1/2	354	135**
4-(2,4-DB) ester	1	114	51**
4-(2,4-DB) amine	1/2	255	894**
4-(2,4-DB) amine	1	324	219**
4-(MCPB)	1/2	315	1068**
4-(MCPB)	1	453	756**
2,4-D amine	1/2	435	840**
2,4-D amine	1	108	465**
Check		381	2571

** Difference from check exceeds .01 level of significance.

(Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

Effects of 2,4-D, MCP, and 4-(2,4-DB) on red clover, sweetclover, and alfalfa sown with an oat companion crop. Robinson, R. G., Jordan, L. S., and Dunham, R. S. Medium red clover, biennial white sweetclover, and Ranger alfalfa were sprayed with 1/2 or 3/4 lb per acre of 2,4-D, MCP, or 4-(2,4-DB). The legumes were about 6 inches tall and the oat companion crop was 15-18 inches with the panicle emerging from the boot. All formulations were the amine salt and applied at 20 gallons per acre. Results: Both rates of each herbicide killed lambsquarters, but the kill was slower with 4-(2,4-DB) than with 2,4-D or MCP. There was no injurious effect on any legume from 4-(2,4-DB). MCP and 2,4-D at 3/4 lb per acre killed alfalfa and severely injured it at 1/2 lb per acre. MCP did not injure sweetclover. 2,4-D at both rates reduced stand and fall growth of sweetclover. Red clover sprayed with MCP had slightly less stand and fall growth than unsprayed. 2,4-D at 3/4 lb per acre killed red clover and at 1/2 lb it severely injured the clover. Results of these trials should not be used to compare relative tolerance of the three legumes but furnish a comparison of herbicides and rates for each legume. (Contribution from the Department of

Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minnesota, Paper No. 3655, Sci. Jour. Series, Minn. Agricultural Experiment Station.)

Giant foxtail control in alfalfa after the first hay crop is removed. Robinson, R. G., Jordan, L. S., and Dunham, R. S. A one-year old stand of alfalfa was mowed June 12, raked June 15, and sprayed June 19. Giant foxtail had 3-4 leaves. Herbicides and rates in lb per acre were TCA 5, 7 1/2, or 10; dalapon 2, 5, 7 1/2, or 10; ATA 2; and TCA 5 plus 2,4-D amine 1/4. Results: ATA killed the alfalfa. TCA and dalapon at all rates killed the foxtail. Alfalfa was not injured by TCA at 5 lb or dalapon at 2 lb per acre. Heavier rates of TCA and dalapon caused slight temporary injury. The combination of TCA and 2,4-D severely injured alfalfa. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3652, Sci. Jour. Series, Minn. Agricultural Experiment Station.)

Comparison of the action of various chemicals on six different crop and weed species. Vanden Born, Wm., and Corns, Wm. G. The experimental area was seeded on May 24, 1956, to separate plots of alfalfa, sweetclover, tartary buckwheat, and a mixture of weed seeds. Of the mixture only hempnettle grew well, and a dense stand of this weed was obtained. Chemical treatments included 2,4-D ester (Weedone), low volatile 2,4-D ester (Weedone LV 4), MCP ester (Methoxone), MCP (K-salt), 4-(MCPB) sodium salt (Tropotox), 4-(2,4-DB) sodium salt at 6 and 12 oz per acre and neburon at 1 and 2 lb per acre. Growth stages at spraying time were as follows: Alfalfa 2-4 leaves (3-5 inches high); sweetclover 4-6 leaves (4-6 inches high); tartary buckwheat 5-6 inches high; hempnettle 3-6 inches high. Spraying dates were June 23 for tartary buckwheat, July 2 for alfalfa and hempnettle, July 9 for sweetclover. On alfalfa the 6 oz per acre rate of LV 2,4-D caused a significant reduction in yield (30%). 2,4-D, MCP, and LV 2,4-D at 12 oz per acre rates caused very marked, highly significant yield reductions (56-80%). Sweetclover yield reductions were highly significant on plots treated with 2,4-D, MCP, LV 2,4-D at 6 oz per acre (30-65%) and 12 oz per acre (60-90%). Less marked, but still significant decreases (13-18%) were obtained on plots treated with 12 oz per acre of 2,4-D, 4-(MCPB) sodium salt, K-MCP, and 2 lb per acre neburon. Tartary buckwheat seed yields showed highly significant decreases as the result of treatment with 2,4-D, MCP and LV 2,4-D at 6 oz per acre (47-62%) and 12 oz per acre (59-63%). 4-(2,4-DB) sodium salt at 6 and 12 oz per acre, and K-MCP at 12 oz per acre caused significant reductions. Hempnettle showed 60-70% control after treatment with MCP ester and K-MCP at 6 oz per acre. 12 oz per acre rates of these chemicals gave almost 100% control. Control with 4-(MCPB) sodium salt at 12 oz per acre was estimated at 50%. 2,4-D gave no control of this weed species. (Division of Crop Ecology, Department of Plant Science, University of Alberta.)

Tolerance to herbicides of established legumes, grown for seed. Yeo, R. R. and Dunham, R. S. To determine the response of alsike and red clovers to specific herbicides the following treatments were made: 2,3,6-TBA, at 1/4, 1/2 and 1 lb per acre; MCPA, 1/2 lb per acre; 4-(MCPB), 1/4 and 1/2 lb per acre; and 4-(2,4-DB), 1/4, 1/2 and 1 lb per acre. Applications were made when both clovers were in approximately 5% bloom. Observations were made on volunteer sweetclover and Canada thistles growing in the plots. Results: 2,3,6-TBA, at 1/2 and 1 lb per acre top-killed the legumes; 1/4 lb per acre prevented seed formation. MCPA top-killed the legumes. They recovered to produce seed, but yields were drastically reduced. 4-(MCPB) had no apparent effect on the legumes or the Canada thistle. 4-(2,4-DB), 1 lb per acre, gave good top-kill of Canada thistles that were 10 inches or less in height. Other trials showed 4-(2,4-DB) at 2 1/2 lb per acre gave only a negligible reduction in seed yield. 2,3,6-TBA and 4-(2,4-DB) at the high rates caused the sweetclover blossoms to "strip off". This was probably accentuated by the abundance of cloudy

weather. Viability of the legume seed was not affected, although one sample of seed from the MCPA treatment had a large number of hypocotyls emerging first. (Contribution of the Department of Agronomy and Plant Genetics, University of Minnesota, Paper No. 3661 Sci. Jour. Series, Minn. Agricultural Experiment Station.)

Herbaceous Weeds in Pastures and Meadows

M. K. McCarty

Summary

Two abstracts were received, one on control of wild garlic and the second on control of ironweed. Repeated applications in spring and fall of 2,3,6-TBA at 2 and 4 lb per acre, MH and ATA at 6 lb, 2,4-D at 2 lb or dalapon at 8 and 15 lb gave good control of the garlic. Single treatments with any of the chemicals were less effective. Ironweed was treated with several formulations of 2,4-D at 1 and 2 lb rates. The 2 lb rate of the low volatile esters and the 1 lb rate of esters applied in a 1:4 oil-water emulsion gave reductions in stem numbers of 72 to 86 percent.

Abstracts

Control of wild garlic with herbicides. Klingman, Dayton L. and Kerr, H. D. Herbicides were applied to wild garlic at 40 gallons spray per acre in a replicated experiment. Repeated treatments applied November 20 to December 3, 1954 in the fall and April 1, 1955 in the spring gave much better control than a single treatment made in the fall. According to estimates made in March of 1956, a sodium salt formulation of 2,3,6-trichlorobenzoic acid (2,3,6-TBA) completely eliminated wild garlic when applied at 2 and 4 lb per acre in both fall and spring as repeated treatments. Reductions of 46 and 90 percent respectively, resulted with these rates when applied only in the fall. MH and ATA at 6 lb in repeated treatments eliminated the wild garlic but treatments with 3 lb gave control of 80 percent and less. Single applications in the fall were unsatisfactory. Repeated treatments with 2 lb of an amine salt of 2,4-D resulted in 84 percent control. Lower rates of single applications were unsatisfactory. Dalapon in repeated treatments of 8 and 15 lb per acre gave 97 percent control of wild garlic. A single fall treatment was less effective. (Contribution of the Field Crops Research Branch, ARS, U. S. Department of Agriculture and the Missouri Agricultural Experiment Station cooperating.)

Effect of several formulations of 2,4-D on ironweed (*Vernonia baldwinii*). McCarty, M. K. Plots 30 x 100 ft in three replications were sprayed in June, 1955 with 1 and 2 lb rates of various formulations of 2,4-D for control of ironweed. The spray was applied with a tractor sprayer at 16 gpa. The amine salt, isopropyl ester and butoxyethanol ester of 2,4-D (with and without translocator additives) were used. As one of the additive formulations was oil-soluble, a 1:4 oil-water emulsion was used to bring it to 16 gpa. A similar treatment using 1 lb of isopropyl ester was also applied in the 1:4 oil-water emulsion. The 1 lb rate of isopropyl ester and butoxyethanol ester gave about 35 percent reduction of ironweed stand; the 2 lb rates of isopropyl ester and amine salt gave 54 percent reduction of stand. The 1 lb rate of isopropyl ester in oil, both 1 and 2 lb rates of the oil-soluble butoxyethanol ester, the 2 lb rate of butoxyethanol ester with and without additive all gave reductions ranging from 72 to 86 percent. These reductions were based on stem counts in ten 2 x 4 ft quadrats per plot. Initial counts were made in 1955 prior to treatment and final counts in June 1956. Check plots averaged from 10 to 16 percent increase in number of ironweed stems. (Contribution of the Fields Crops Research Branch, ARS, USDA and the Nebraska Agricultural Experiment Station cooperating.)

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Effect of several formulations of 2,4-D on ironweed (Vernonia baldwini). McCarty, M. K. Plots 30 x 100 ft in three replications were sprayed in June, 1955 with 1 and 2 lb rates of various formulations of 2,4-D for control of ironweed. The spray was applied with a tractor sprayer at 10 gpa. The amine salt, isopropyl ester and butoxyethanol ester of 2,4-D (with and without translocation additives) were used. As one of the additive formulations was oil-soluble, a 1:4 oil-water emulsion was used to bring it to 10 gpa. A similar treatment using 1 lb of isopropyl ester was also applied in the 1:4 oil-water emulsion. The 1 lb rate of isopropyl ester and butoxyethanol ester gave about 35 percent reduction of ironweed stand; the 2 lb rates of isopropyl ester and amine salt gave 54 percent reduction of stand. The 1 lb rate of isopropyl ester in oil, both 1 and 2 lb rates of the oil-soluble butoxyethanol ester, the 2 lb rate of butoxyethanol ester with and without additive all gave reductions ranging from 72 to 86 percent. These reductions were based on stem counts in two 2 x 4 ft quadrats per plot. Initial counts were made in 1955 prior to treatment and final counts in June 1956. Check plots averaged from 10 to 16 percent increase in number of ironweed stems. (Contribution of the Fields Crops Research Branch, ARS, USDA and the Nebraska Agricultural Experiment Station cooperating.)

SUGAR BEETS

Summary E. A. Helgeson

Only four abstracts were received this year and all of these were from the Red river valley area. Three of these were reported by Andersen and Helgeson.

Andersen and Helgeson tested the possibility of eliminating hand labor in producing a crop of beets. Pre-emergence applications of several chemicals were made in bands over the rows. Data are not yet available on beet yields but weed control was quite satisfactory in several instances with endothal, CDAA, and TCA. CDAA was rather toxic to beets.

Dichloral urea was tested as a means of controlling grasses when applied at pre-planting and pre-emergence. Results on wild oats were somewhat inconclusive but control of Setaria was excellent. Sugar content was not reduced but yields were reduced at the 14.6 lb/A rate.

In large scale field trials Schreiber reported excellent control of wild oats with IPC and CDAA. Pre-planting band treatments were applied at rates of 1.5 to 2 lb/A for IPC and .4 lb/A for CDAA. Beet yields were comparable to hand-weeded check plots.

Abstracts

Effect of several pre-emergence treatments on stands of sugar beets and weeds. Andersen, Robert N. and Helgeson, E. A. A study on the possibility of producing a crop of beets without hand labor was conducted at West Fargo, N.D. in 1956. In this study, segmented multigerm seed (American Crystal variety AM 1 LSR) was planted 3 in apart in the row. No blocking or further thinning was done except in the conventionally treated checks. Complete data on this study are not yet available, however it was apparent that under the conditions of the test, the 3 in spacing was entirely too close. Results of the first phase of the study (pre-emergence treatments) are reported here. Beets were planted May 17, 1956 in Fargo clay soil which was quite dry at the surface. Pre-emergence treatments were applied May 19 in 12 in bands centering over the rows. The chemicals; 2 chloro-N,N-diallylacetamide (CDAA) disodium 3,6-endoxohexahydrophthalate (endothal); and sodium trichloracetate (TCA) were applied at the rates and in the combinations shown in table. In the 10 days following treatment several light showers totaling only .14 in occurred. On the 11th day, .3 in fell and 1.98 in fell in the following week. Rainfall amounts are only approximate. The annual grasses present were mostly Setaria spp. (with S. viridis by far the most prevalent) and a small amount of Echinochloa crusgalli. Of the broad-leaved weeds, only rough pigweed (Amaranthus retroflexus) and wild buckwheat (Polygonum convolvulus) occurred in great enough numbers to warrent reporting here. Data below were taken one month after treatment and are derived from 18 six ft samples in each treatment.

	Check	CDAA 6 lb	endothal 6 lb	CDAA 4 lb + endothal 6 lb	TCA 6 lb	TCA 4 lb + endothal 6 lb
		Percentage reduction in stand based on check				
	No. 1/	%	%	%	%	%
Sugar beets	26.5	56	1	34	0	0
Annual grasses	56.2	85	66	87	98	98
Rough pigweed	13.8	95	76	95	78	77
Wild buckwheat	4.3	33	40	58	7	67

1/ Actual number of plants per 12 linear ft of row in band 8 in wide.

(Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture and North Dakota Agr. Exp. Sta., Fargo, North Dakota.)

Applications of sodium salt of 2,2-dichloropropionic acid (dalapon) to weed free sugar beets. Andersen, Robert N. and Helgeson, E.A. Beets (American Crystal variety AM 1 LSR) were planted in a Bearden silt loam soil near Fargo, N.D. May 10, 1956. Individual plots consisted of 4 rows 30 ft long. Rows were 20 in apart and beets were blocked to 20 in apart in the row. Beets were hand thinned and were kept free of weeds for the entire season by cultivation, hoeing, and hand-weeding as needed. Dalapon was applied as a broadcast application in 20 gal aqueous solution/A at the rates and stages shown in table. Yields were taken Sept. 24-26 from a total of 46 2/3 ft of row from the 2 center rows in all plots. Sugar analyses were made by the American Crystal Sugar Co. The data summarized below are from a randomized block with 4 replications.

Stage of treatment	Dalapon 2 lb Yield	Dalapon 2 lb Sugar	Dalapon 4 lb Yield	Dalapon 4 lb Sugar	Dalapon 6 lb Yield	Dalapon 6 lb Sugar
	T/A	%	T/A	%	T/A	%
Pre-emergence (May 17)	17.9	16.69	17.0	15.93	16.4	16.86
Cotyldeons to 2 true leaf (June 1)	16.4	16.18	15.7	17.24	15.3*	16.08
4-6 true leaf (June 8)	17.1	15.62*	16.4	16.48	15.8	16.56
6-8 true leaf (June 15)	16.4	16.32	15.5*	16.62	15.3*	16.60
10-14 true leaf (June 20)	16.8	16.55	15.2**	17.06	14.0**	16.58
Untreated Check	17.0 T/A,		16.75% sugar			

LSD Yield 5% = 1.4T, 1% = 1.8T; Sugar 5% = 0.87%, 1% = 1.16%

Rates are in terms of acid equiv/A. One and two asterisks indicate significant reductions from check at 5% and 1% level of probability, respectively.

Results of post-emergence treatments of dalapon on wild oats and Setaria this year and in 1954 and 1955 indicate control of these weeds at rates in the order of 4 to 6 lb and 2 to 4 lb respectively. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture and North Dakota Agr. Exp. Sta. Fargo, North Dakota).

Applications of dichloral urea (DCU) to weed free sugar beets. Andersen, Robert N. and Helgeson, E. A. A split plot design with 2 methods of DCU application as main plots and rates of DCU as sub-plots was laid out in a field of Bearden silt loam near Fargo, N.D. On May 10, 1956 the pre-planting treatments shown in the table below were applied broadcast to the soil surface and immediately incorporated into the upper 2 in of soil with a small garden roto-tiller.

The area was planted immediately to beets (American Crystal variety AM 1 LSR). Pre-emergence treatments were applied broadcast on May 12. Individual plots consisted of 4 rows 30 ft long. Rows were 20 in apart and beets were blocked to 20 in apart in the row. Beets were hand thinned and were kept free of weeds for the entire season by cultivation, hoeing, and hand weeding as needed. Yields were taken Sept. 26 and 27 from a total of 46 2/3 ft of row from the 2 center rows in each plot. Sugar analyses were made by the American Crystal Sugar Co. The data summarized below are from 3 replications.

	Pre-planting		Pre-emergence	
	Yield T/A	Sugar %	Yield T/A	Sugar %
Check	17.2	17.02	16.4	17.15
DCU 7.3 lb/A	17.1	17.08	15.6	16.90
DCU 14.6 lb/A	14.6**	17.10	13.4**	16.73

LSD (Yield) for treatments within each method, 5% = 1.7T; 1% = 2.5T

The above data indicate that 14.6 lb of actual DCU per acre was detrimental to beets in both methods of application. Some reduction apparently occurred from 7.3 lb pre-emergence but the reduction was not statistically significant. An unexplained indication of benefit from roto-tilling is shown by the difference between the 2 types of checks. However this difference is not significant when tested by the appropriate LSD for that comparison. None of the treatments significantly affected the sugar content. In tests on Setaria in Fargo clay soil this year, pre-planting treatments (roto-tilled in 2 in deep) gave 96 and 100% control at 7.3 and 14.6 lb actual DCU/A. In the same test the sodium salt of trichloroacetic acid (TCA) in pre-emergence treatments gave 92 and 99% control for 4 and 8 lb acid equiv/A. Data on pre-planting treatments with TCA were not obtained. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture and North Dakota Agr. Exp. Sta. Fargo, North Dakota.)

Wild oat control in sugar beets. Schreiber, K. On eight fields in the sugarbeet area of Manitoba the control of wild oats with IPC and CDAA was demonstrated. In every case plots of 3-5 acres where a wild oat growth was anticipated, were selected and preplanting band-treatments applied as soon as fields were fit for planting. A good seedbed was prepared and two kinds of equipment were used. (a) Booms with nozzles 20-24 inches apart were made up to accommodate the various row width patterns in use and to allow 6-8 inches band spraying over the beet rows. These booms were mounted in front of the tractor. Under the tractor-cultivator bar a "Cultro" machine was mounted for mixing the material into the soil and driven from the power take off. The spraying equipment was driven from the tractor pulley. Finally a planter following exactly in the treated portion of these bands was pulled behind the tractor. (b) Basically the same set-up was mounted on another tractor using a spraying and rototiller equipment as is manufactured by the "Howry-Berg Iron Works Co." in Englewood, Colorado.

Rates used for band applications: IPC, 1.5 to 2.0 lb/A; CDAA, .4 lb/A; in 5-15 gal. of water. In some cases water up to 5 gal. was gradually replaced with equal amounts of diesel oil.

General observations: Both chemicals were equally effective in giving excellent control of wild oats. The damage to beets was negligible with IPC but with CDAA somewhat more pronounced, but by seeding rates of approximately 6 lbs. processed seed per acre, stand counts taken after thinning produced the same amount of beets in the treated rows as in the untreated portion of the fields. Shallow

planting depositing the seed in the mixed layer of soil caused stubby sprouts of the emerging seedlings from which the plants recovered as soon as they developed the first pair of true leaves. Part or full replacement of water up to 5 gal/A with diesel oil increased the effectiveness of wild oat control and killed almost all broad-leaf weeds except wild buckwheat. The mixing of the herbicide and the flow through the nozzles was perfectly achieved. On the other hand this mixture was harder on the seedlings so that a study for the best rates od diesel oil mixtures with IPC and CDAA appears desirable. In general, best results were obtained if the water rate was kept at the 5 gal/A level.

The greatest obstacle to overcome in this otherwise economical and effective control measure appears to be the seedbed disturbance by using the cultro or rototiller (more pronounced by the former) which delayed the germination of the seed in the treated portions.

This shortcoming should be remedied by adding depth wheels to the cultro to confine the mixing to the top one inch layer of soil and to adjust the depth bands of the planter to 1½ inches thus establishing the necessary soil-mixture-seed contact for quick germination of the seed. Despite delayed emergence of treated beets, yields were comparable to hand-weeded beets. (Contributions from the Manitoba Sugar Company, Winnipeg.)

TURF

Summary **Oliver C. Lee**

From abstracts submitted it is apparent that several herbicidal materials will give some degree of control of crabgrass in turf. Some appear to be most effective when applied early in the season before crabgrass emerges, while others produce best control when applied after emergence. Both degree of crabgrass control and injury to or discoloration of desirable turf grass are considered in evaluating these herbicides. Temperature and moisture appear to effect results obtained with post-emergence treatments.

Five abstracts on chickweed control were submitted. It is apparent that an effective herbicide for chickweed control must possess residual properties. Many materials when applied directly to the foliage will destroy the plant but do not protect the area against reinfestation from later germinating seeds. This apparently is also true of knotweed control. One abstract on white clover control and one on prevention of seed head development of bentgrass were submitted.

Abstracts

Selective post-emergent knotweed control in turf. Daniel, W. H. and Goetze, N. R. A comparison of commercially available materials for possible control of knotweed, Polygonum aviculare, in a mixed stand of annual and perennial grasses was initiated on July 6. The experimental area was under a low level type of management, receiving very little fertilizer and no irrigation. Materials tested were disodium methyl arsonate 6 lbs/A, 2,4-D amine 1 lb/A, Neburon 4 lbs/A, sodium arsenite 2 and 3 lbs/A, combinations of disodium methyl arsonate 6 lbs/A, and 2,4-D 1 lb/A, and 2,4,5-T 1 lb/A, and a mixture of 2,4-D 1 lb/A and 2,4,5-T 1 lb/A. Any treatments containing disodium methyl arsonate were retreated with disodium methyl arsonate alone in one week. The best control was obtained from Neburon, although the response was very slow in developing. A mixture of disodium methyl arsonate and 2,4-D gave a very fast response, but approximately 25% of the plants made regrowth from the crowns. Disodium methyl arsonate alone did not give as effective control as when mixed with 2,4-D. 2,4-D improved the effectiveness of disodium methyl arsonate to a greater extent than 2,4,5-T. The mixture of 2,4-D and 2,4,5-T gave better control than 2,4-D alone. Plots receiving sodium arsenite were severely burned, but considerable knotweed regrowth occurred. Plantain, Plantago lanceolata, persisted and became dominant on the Neburon plots. Plantain was controlled on any plots receiving the phenoyacetic acids. Stinkgrass, Eragrostis spp., was also controlled by disodium methyl arsonate. (Contribution of Department of Agronomy, Purdue University, Agricultural Experiment Station).

Pre-emergent herbicides for the control of crabgrass in turf. Daniel, W. H. and Goetze, N. R. A group of herbicide materials was tested for their activity on young crabgrass, Digitaria sanguinalis. On May 12 a single application of the materials was made to a dry bluegrass turf in which no crabgrass seedlings had yet developed. The area was thoroughly hand-watered after treatment. An extended dry period prevented the development of crabgrass seedlings in the experimental area for a month after treatment. Supplemental irrigation

was applied on June 15 and normal growth of crabgrass was initiated. Visual ratings of crabgrass control were taken on August 12. The following treatments were ineffective: Cl IPC 4 lbs/A, SES 9 lbs/A, PMAS 8 fl. oz./A, Neburon 2 lbs/A, sodium arsenoacetate 40 fl. oz/A, and cacodylic acid 6 fl. oz/A. Several of these treatments may have been effective with repeated applications, but this trial was designed on the assumption that one single pre-emergent application is more desirable than several in one growing season. Treatments which controlled crabgrass during the season and their estimated percentage control were: lead arsenate 1000 lbs/A 87%, calcium arsenate 600 lbs/A 91%, Alanap 1-F (N-1-Napththyl phthalamic acid on vermiculite) 800 lbs/A 88%, Scutl (commercial mixture of PMAS and N-1-Napththyl phthalamic acid) 120 lbs/A 23%, Neburon 4 lbs/A 50%, Neburon 6 lbs/A 55%, Neburon 8 lbs/A 70% and chlordane 80 lbs/A 60%. (Contribution of Department of Agronomy, Purdue University, Agricultural Experiment Station).

Post-emergence herbicides for crabgrass control in turf. Daniel, W. H. and Goetze, N. R. A comparison of formulations of crabgrass controlling chemicals was conducted on a bluegrass lawn containing 65% crabgrass cover. Treatments were applied August 5, 10, 15, 1956.

Entry	Material	Rate used as formulated 1,000/sq.ft.	Rating of crabgrass kill 8-18	% of area as crabgrass 3 weeks	10 weeks later
At equivalent rate of arsenic					
1	Crab-E-Rad	.25#	2	1	0
3	Weedone Sodar	3.0 #	8	70	23
5	Clout	5.0#	3	1	0
7	Di-met	.15 qt.	2	2	0
9	Vaughan's Sodar	.24#	2	1	0
11	Weedone powder	.25#	2	1	0
13	Methar	.15#	2	1	0
At formulator's label rate					
2	Weedone Sodar	3.3#	7	70	25
4	Clout	9.0#	2	0	0
6	Di-met	.1 qt.	4	7	1
8	Vaughan's Sodar	.25#	2	1	0
10	Weedone powder	.25#	2	1	0
12	Methar	.16#	2	1	0
Others					
14	Arsenoacetate	5 fl. oz.	8	65	50
15	Cacodylic acid	1.5 fl. oz.	3	4	7
16	PMAS	2.5 fl. oz.	3	2	2
17	Scutl	4#	6	30	12
18	Petroleum oil distillate	1 gal.	4	21	35
21	Check	---	9	80	75
Range			1-complete kill 9-no effect	80 - 0	75 - 0

Low volume applications of oils gave spotty control with little tolerance for safety. All formulations of DSMA, except Weedone Dry, gave control of crabgrass, Digitaria sanguinalis, and green foxtail, Setaria viridis. All DSMA plots at formulator's rates were sufficient, except Di-met (suggests only 2/3 recommended rate of 8 oz. 50% disodium methyl arsenate hexahydrate/1,000 sq. ft.). PMAS formulation was slower responding and reduced growth of bluegrasses during spray series. Arsenic in the form of cacodylic acid appears to have considerable activity on crabgrass and warrants additional study. (Contribution of Department of Agronomy, Purdue University, Agricultural Experiment Station).

Crabgrass control in bluegrass turf. Davis, R. R. An unirrigated golf course fairway mowed regularly to 1½ inch was used for tests (a) and (b). The permanent sod consisted chiefly of bluegrass with small patches of bent. Test (c) was on bluegrass mowed 2 inches high. Except where noted, treatments were applied as an aqueous spray at the rate of 2.3 gal/1000 sq. ft. All plots were 100 sq. ft. The degree of control was estimated by sampling five - 1 sq. ft. areas on each plot. The results of tests (a) and (b) are shown in the table. There was no injury to desirable grasses for any treatment other than very slight temporary discoloration.

Test (a). The first application of each treatment was made on May 8, before crabgrass germinated. Subsequent applications were made 6 weeks later where 2 applications were applied and 5 and 10 weeks later where 3 applications were applied. The NPA was a dry form for spreader application (Alanap - 1F).

Test (b). The first application was made June 21. The crabgrass was in the 3 to 4 leaf stage. Subsequent applications, when applied, were made 1 week apart.

Percentage of area covered by crabgrass Sept. 25, 1956

Treatment (test a)	Avg. 3 reps.	Treatment (test b)	Avg. 4 reps
Neburon - 1.5 oz/1000 sq. ft. 1 application	33	DSMA - 2 oz/1000 sq. ft. 2 applications	13
Neburon - 1.5 oz/1000 sq. ft. 2 applications	3	DSMA - 2 oz/1000 sq. ft. 3 applications	18
Neburon - 3 oz/1000 sq. ft. 1 application	10	DSMA - 4 oz/1000 sq. ft. 1 application	29
NPA - 2.9 oz/1000 sq. ft. 3 applications	7	PMA - 0.18 oz/1000 sq. ft. 3 applications	5
NPA - 2.9 oz/1000 sq. ft. 2 applications	9	PMA - 0.15 oz/1000 sq. ft. 4 applications	4
NPA - 2 applications 5.8 and 2.9 oz/1000 sq. ft.	1	Sodium arsonoacetate 1 oz/1000 sq. ft., 3 appl.	55
Check	55	Check	66
LSD 5%	25	LSD 5%	14
LSD 1%	36	LSD 1%	19

Test (c). The first application was made July 10. Four additional applications of all treatments were made 1 week apart. Treatments were Disodium Methylarsonate-hexahydrate (DSMA), spreader application, 2.25 oz/1000 sq. ft.;

PMA spreader application, 0.38 oz/1000 sq. ft.; DSMA, 2 oz/1000 sq. ft.; PMA, 0.18 oz/1000 sq. ft.; Sodium arsonoacetate, 1 oz/1000 sq. ft. PMA in both forms and DSMA as a spray gave good control. DSMA applied dry was less effective. Sodium arsonoacetate gave some reduction in crabgrass but not a satisfactory degree of control. (Contribution of Ohio Agricultural Experiment Station, Wooster, Ohio).

Control of chickweed in lawns. Forsberg, D. E. Neburon was sprayed on chickweed in a Kentucky bluegrass lawn at ½, 1, 2, 3, 4, 6, and 8 lbs/A using 6 gal. of water per acre. Results: One hundred percent kill of chickweed was obtained with all treatments in the test. However, it was noted that the lower rates, up to 3 lbs/A, had regrowth starting later on in the season and would require another application. The above mentioned treatment had no effect on the stand of grass. (Contribution of Experimental Farm, Scott, Saskatchewan, Canada).

Effect on chickweed, Stellaria media, and some other species of annual weeds of 1-n-butyl-3-(3,4-dichlorophenyl)-1-methylurea (neburon). Friesen, H. A. Neburon at dosages of 7.2, 3.6 and 1.8 lb/A active ingredient was applied to chickweed at different dates and locations. In each test water was used as the diluent at the rate of 100 gal/A. Test I. On June 5 the 7.2 and 3.6 lb/A dosages were sprayed on chickweed in Kentucky bluegrass sod, which had been thinned by winter injury. The chickweed was growing rapidly but had not as yet begun to flower. Each treatment eliminated the weed. Subsequent emergence of chickweed occurred throughout the summer and early fall months. Where the 7.2 lb/A rate was used the newly emerged plants were killed while still in the cotyledon stages. Late in August the effect of the treatment began to wane and by mid-September a stand equal to 20% of the original infestation had established itself. While the plants were stunted they flowered and set some seed. The 3.6 lb/A dosage was not nearly as effective in that the weed had recovered by some 50% of the original stand in mid-July and had increased to 75% by mid-August. The plants appeared normal but grew slowly. The bluegrass suffered no apparent injury or reduction in vigor of growth.

Test II. The three dosages given above were applied to chickweed on June 6 to a cultivated area under mature elm trees. The effect on the chickweed of the two heaviest dosages was essentially the same as that described in Test I. The 1.8 lb/A rate gave unsatisfactory control. Shepherds' purse, Capsella bursa-pastoris, and worm-seed mustard, Erysimum chieranthoides, were killed by the two heavier treatments. Dandelion, Taraxicum officinale, Russian pigweed, Axyris ameranthoides, lambs quarters, Chenapodium album, plantain, Plantago major, buttercup, Ranunculus acris, and groundsel, Senecio vulgaris, were not killed nor controlled by any of the treatments.

Test III. In late July neburon at 7.2 lb/A was applied to fully developed chickweed in Kentucky bluegrass sod. Within three weeks the weed was completely dead. Subsequent emergence of chickweed plants were killed by the chemical before they passed out of the seedling stage. (Contributed by the Experimental Farm, Lacombe, Alberta, Canada).

Prevention of seedhead development in bentgrass sod production. Goetze, N. R. and Daniel, W. H. In the production of vegetative strains of bentgrass stolons, seedhead production would result in contamination of the strain. This trial was conducted on old stolon rows of Pennlu creeping bentgrass (Agrostis palustris). The materials were applied on May 22, 1956, at which time seedheads

had not emerged. By June 15, a normal crop of seedheads had emerged in the check plots. Maleic hydrazide (MH-30), diethanolamine salt, at rates of 5, 10 and 15 pounds active ingredient per acre completely prevented seedhead development. The heavier rates caused some bentgrass sod damage. Applications of 1 pound indolbutyric acid, 1 pound of indolacetic acid, and 10 pounds of cobaltous sulfate had no effect upon seedhead development. These results indicate that lower rates of maleic hydrazide should be tested and that timing of application should be very critically evaluated, not on calendar date, but on physiological stage of the grass. (Contribution of Department of Agronomy, Purdue University, Agricultural Experiment Station).

Control of chickweed in bluegrass turf. Goetze, N. R. and Daniel, W. H. Post-emergent applications of herbicides were made to bluegrass turf containing young chickweed, Stellaria media, during October and November. Visual ratings of chickweed control and turf injury were taken periodically. Disodium methyl arsonate at 5 and 10 lbs/A gave a good quick vegetative knock down, but regrowth developed later. A petroleum distillate at the rate of 40 gallons per acre gave a typical oil burn. The chickweed was held in check for a short period, but subsequent regrowth appeared about one month later. The bluegrass turf was slightly damaged by the oil. Neburon at 4 lbs/A gave good control which lasted for the entire season. A period of three weeks was required for the effects to develop. No injury to the turf was noted. Calcium arsenate at 800 lbs/A had little, if any, effect on growth of chickweed. (Contribution of Department of Agronomy, Purdue University, Agricultural Experiment Station).

Herbicide treatments for crabgrass control. Hart, R. D. and Ingle, M. Pre-emergence treatments for crabgrass control were applied on April 19, 1956, to a golf course fairway which was heavily infested with crabgrass the previous year. Chemicals applied as aqueous sprays were: Chlordane (emulsifiable), 75 lb/A and 100 lb/A; Neburon, 4 lb/A and 6 lb/A. Applied in the dry forms were Chlordane (25% granular) at 75 lb/A and 100 lb/A and NP (Alanap 1F) at 6.75 lb/A and 11.25 lb/A (all rates as active ingredient). Visual estimates of percent control were made on July 8, 1956, and again on October 9, 1956. Values are averages of four replications. The first percentage below was the control at the time of the first rating and is followed by the second rating. Chlordane emulsifiable 75 lb/A 60%, 50%; 100 lb/A, 96%, 88%; Chlordane emulsifiable 75 lb/A, 82%, 57%; 100 lb/A 92%, 82%; Alanap 1F 6.75 lb/A, 65%, 35% 11.25 lb/A, 90% 69%; Neburon 4 lb/A, 48%, 37%; 6 lb/A, 60%, 45%. No treatment produced marked injury to bluegrass. (Contribution of the Department of Botany and Plant Pathology, Purdue University, Agricultural Experiment Station).

White clover control in bluegrass turf. Hogard, T. W. and Hemphill, D. D. Plots of Kentucky bluegrass (Poa pratensis), infested with white clover (Trifolium repens) were treated on May 11 with the following chemicals: 2,3,6-TBA, 4 lb/A and 6 lb/A; NPA (Alanap 1F) 18 lb/1000 sq. ft. On June 8 the following were applied: 2-(2,4,5-TP), 2 lb/A; 2,3,6-TBA, 2 lb/A; 2,4,5-T, 2 lb/A; and endothal, 1.5 lb/A. Control is listed as percentage and discoloration of bluegrass (on scale of 0 to 5 with 0 for none and 5 for permanent injury with some loss of grass) is in parenthesis: 2,3,6-TBA, 6 lb/A, 99% (4.5); 4 lb/A, 97% (3.7); 2 lb/A, 90% (1.0); NPA (Alanap 1F), 50% (0.0); 2-(2,4,5-TP), 100% (2.0); 2,4,5-T, 100% (2.5); and endothal 66% (2.5). Both 2-(2,4,5-TP) and 2,4,5-T, although controlling white clover, caused excessive discoloration of the bluegrass. 2,3,6-TBA at 2 lb/A was the only treatment that gave satisfactory control without excessive discoloration. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station).

<u>Spring control of chickweed in lawns</u>. Hogard, T. W. and Hemphill, D. D. Following chemicals were applied in April to randomized, replicated plots of Kentucky bluegrass (<u>Poa pratensis</u>) containing common chickweed (<u>Stellaria media</u>): 2,4-D, 2 lbs/A*; ammonium sulfate, 2 lbs./100 sq. ft.; CIPC, 3 lbs/A*; KOCN, 16 lbs/A; 2,4,5-T, 3 lbs/A*; Neburon, 2 lbs/A; DNBP, 1 qt/100 gal. water per acre; 2-(2,4,5-TP), 1.66 lb/A*; 2,3,6-TBA, 4 lbs/A. Control is listed as percentage and discoloration of bluegrass (on scale of 0 to 5 with 0 for none and 5 for permanent injury with some loss of grass) is in parenthesis: 2,4-D, 67% (1.5); ammonium sulfate, 95% (0.0); CIPC, 72% (0.0); KOCN, 60% (2.0); 2,4,5-T, 97% (4.0); Neburon, 72% (0.0); DNBP, 50% (4.5); 2-(2,4,5-TP), 100% (1.5); 2,3,6-TBA, 100% (1.0). Excellent control was given by 2,4,5-T but discoloration was excessive. 2-(2,4,5-TP) and 2,3,6-TBA gave excellent control with slight discoloration. Control by use of ammonium sulfate was excellent and bluegrass was not discolored. (*Plus one percent sticker). (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station).

<u>Post-emergence control of crabgrass in lawns</u>. Hogard, T. W. and Hemphill, D. D. Crabgrass (<u>Digitaria sanguinalis</u>), in the two to three leaf stage of growth, was treated with the following chemicals: Disodium methyl arsonate (Sodar) 8 lbs/A, 3 treatments; PMA, .7 lb/A, 3 treatments; KOCN (15 lb/A) plus MCP (3 lb/A), one treatment; disodium methyl arsonate (Methar) 8.3 lb/A, 3 treatments; sodium arsenite, 1 lb/A, 2 treatments; and KOCN, 16 lb/A, one treatment. First applications were made on June 13 and final results tabulated on July 10. All multiple applications were at interval of seven days. Control is listed as percentage and discoloration of bluegrass (on scale of 0 to 5 with 0 for none and 5 for permanent injury with some loss of grass) is in parenthesis: DSMA (Sodar), 100% (4.6); PMA 43% (1.5); KOCN-MCP, 82% (4.7); Methar 74% (2.3); sodium arsenite 0% (0.5); KOCN, 67% (2.2). Sodar and KOCN-MCP were the only materials that gave satisfactory control of the crabgrass but both discolored the bluegrass turf excessively. Temperature on day of first applications was 80°F and second application, 95°. Sodar treated bluegrass showed slight discoloration at 80° but at 95° the discoloration was very severe. KOCN-MCP caused very severe discoloration at 80°. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station).

<u>Pre-emergence control of crabgrass in lawns</u>. Hogard, T. W. and Hemphill, D. D. The following chemicals were applied to randomized, replicated plots in a Kentucky bluegrass lawn for pre-emergence crabgrass (<u>Digitaria sanguinalis</u>) control. Treatments were applied May 11, just prior to crabgrass emergence: NPA (Alanap 1F), 18 lb/1000 sq. ft., 2 applications, 5 week interval; 2,4-DES, 4 lb/A, 2 applications, 3 week interval; 2,4,5-TES, 4 lb/A, 2 applications, 3 week interval; 2,4,5-TES, 4 lb/A, 2 applications, 3 week interval; 2,3,6-TBA, 4 lb/A, one application; NPA (Alanap 1F concentrate), 4 lb/1000 sq. ft., one application; Neburon, 4 lb/A one application. Estimated percentage of control of crabgrass, 8 weeks after first treatments, is as follows: NPA (Alanap 1F), 100%; 2,4-DES, 67%, 2,4,5-TES, 85%; 2,3,6-TBA, 80%; NPA (Alanap 1F concentrate) 98% and Neburon, 40%. Only NPA (both Alanap 1F and Alanap 1F concentrate) gave satisfactory control of crabgrass. The latter part of the test period was abnormally dry and probably accounts for unusually good results with the NPA formulations as crabgrass germination was very slow during late June. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station).

<u>Control of mouse-ear chickweed (Cerastium vulgatum) in a lawn</u>. Sexsmith, J. J. A one square rod area, in a Kentucky bluegrass-White Dutch clover lawn at Fort Macleod, Alberta, was treated with 3-(3,4-dichlorophenyl)-1-methyl-1-n-butylurea (Neburon) at a rate of 2 lb/A on July 16, 1956. The lawn was infested with clumps of mouse-ear chickweed to such a degree that approximately 25% of

the lawn area contained little or no grass and clover. When inspected on July 29, the chickweed had been completely killed, leaving large and near-empty patches in the lawn. At this time the grass in the treated area was slightly yellowish, whereas the clover appeared to be relatively unaffected by the treatment. Early in August a reasonably heavy rate of ammonium nitrate fertilizer was applied. When last visited, on October 11, the treated area was free of chickweed, and the deep green grass and clover formed a complete cover of the area. At this same date, the chickweed patches in the untreated sections of lawn were considerably larger than they had been on July 16. (Contribution of Canada Department of Agriculture, Experimental Farm, Lethbridge, Alberta, Canada).

Crabgrass control in bluegrass turf. Stadtherr, R. J. and Nylund, R. E. In 1956, pre-emergence, early post-emergence and seedhead stage treatments were applied in attempts to control crabgrass in bluegrass turf. Quadruplicated plots each 100 sq. ft. in area were used. All liquid herbicides were applied at 30 psi. All herbicides which were mixed with water were applied using 100 gal. of water per acre. Even though spring temperatures were favorable, extremely dry conditions in early June prevented crabgrass germination until approximately June 17 in the treated area. Using a scale of 0 (no injury) to 5 (complete kill), ratings of crabgrass control and bluegrass injury were made 4 weeks after the last application of a particular herbicide. A rating of 4.00 or higher was considered satisfactory crabgrass control. A bluegrass injury rating of 2.00 or higher was considered excessive.

Pre-emergence herbicides were used beginning June 12 before any crabgrass plants could be found. The following rates of active ingredients per acre were applied: 2,4-DES, 10 lbs. applied 3 times at 3 week intervals; Neburon, 4 lbs. applied twice at a 3 week interval; CDAA, 8 lbs. plus 435 lbs/A of 10-10-10 fertilizer applied once; NPA, 8 lbs. twice at 5 week intervals in 2 forms (1% and also a 5% granular form which was mixed with a 10-10-10 fertilizer at 435 lbs/A); 2,4-D 8 lbs. applied 3 times at 3 week intervals, and a combination of NPA (90%) 28.8 lbs. and 2,4 dichlorophenoxy ethyl phosphite (3Y9) 10 lbs. applied twice at 5 week intervals. None of the pre-emergence herbicides gave satisfactory control. However, Neburon gave best control (3.75) with some bluegrass injury (2.25).

Early post-emergence herbicides were first applied June 20, three days after crabgrass plants were observed. About an inch of rain fell on June 14 with daily rains through June 22. The following rates of active ingredients were used: disodium methyl arsenate (DSMA), 4 lbs. and 6 lbs. applied 3 times at weekly intervals; KOCN, 7.3 lbs. plus a wetting agent, 3 times at weekly intervals; PMA, 0.9 lbs. in three forms: 1.49% dry, 2.5% liquid, and 1.25% liquid plus ammonium nitrate at 130 lbs/A, all applied 3 times at weekly intervals; dimethyl arsenic acid, 0.42 lbs., twice at weekly intervals; sodium arsono-acetate, 1.6 lb., twice at weekly intervals and monuron, 1.5 lb., one application. A refined petroleum oil product containing chlordane (standard crabgrass killer "C") was applied in the "boot" stage on July 31 with a second application two weeks later.

In the post-emergence treatments, the following were considered to give satisfactory control with minimum injury to the bluegrass: KOCN gave excellent crabgrass control (4.50) with bluegrass injury only slight (0.75), and PMA (2.5% liquid) gave good crabgrass control (4.25), with little bluegrass injury (1.50). Standard "C" gave complete crabgrass control (5.00) but caused serious bluegrass injury (4.75). Monuron gave good crabgrass control (4.25) but bluegrass injury was excessive (3.50). PMA with ammonium nitrate gave good crabgrass control (4.00) but caused more bluegrass injury (2.25) than PMA alone. Bare areas resulting from the toxicity of some herbicides to bluegrass later became occupied with crabgrass.

Treatments to control crabgrass in the seedhead stage were begun August 10. The following herbicides were applied 3 times at weekly intervals: DSMA, 6 and 10 lbs.; PMA, 0.9 and 1.2 lbs.; KOCN, 7.3 lbs. plus a wetting agent; dimethyl arsenic acid, 0.8 lbs.; and KOCN, 15.7 lbs. plus MCPA, 3.2 lbs. Two petroleum products, Standard Crabgrass Killer and Standard "C" were applied twice at 2 week intervals. Complete crabgrass control (5.00) was obtained with DSMA, PMA, KOCN plus MCPA and Standard "C". However, bluegrass injury was: DSMA 6 lbs. (0.50) and 10 lbs. (3.25); PMA, 0.9 lb. (4.50) and 1.2 lbs. (4.25) KOCN with MCPA (4.25) and Standard "C" (1.75). The KOCN with MCPA effectively removed many broad-leaved weeds also. (Contribution - Paper No. 3649 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station.)

Field and Canning Peas

J. J. Sexsmith

Summary

A total of sixteen abstracts was received, nine of which were for inclusion in this section. Only those chemicals giving slight or no injury to the pea crops are mentioned in the summary.

Field Peas

Pre-planting. At Beaverlodge, Alberta, good wild oat control was obtained with IPC at 10 lb/A.

Pre-emergence. Reported from Brandon, Manitoba, was good grass control with CIPC at 9 lb/A and excellent control of annuals with CDT at 9 lb/A.

Canning Peas

Pre-emergence. Satisfactory control of Setaria spp. was reported as follows: Saskatoon, Saskatchewan - CDAA at 6 lb/A; Farmington, Minnesota - CDAA at 4 and 6 lb/A, monuron 2 lb/A, diuron 2 lb/A, DNBP amine 9 lb/A, and DNBP amine 3 lb plus CDAA 2 lb/A; Madison, Wisconsin - CDAA at 4 lb/A, TCA 6 lb/A, DNBP amine 8 lb/A, and diuron 2 lb/A. Good control of mixed annual weeds was obtained at Guelph, Ontario, with DNBP amine at 4 and 6 lb/A.

Post-emergence. Satisfactory control of Setaria spp. was reported at Farmington, Minnesota, with DNBP amine at 1 and 1½ lb/A, dalapon 1/2 lb or 1 lb plus DNBP amine 1½ lb/A, and dalapon 1 lb plus 4-(MCPB) amine 1/2 or 1 lb/A. At Madison, Wisconsin, good control of grass and broadleaf annuals was obtained with dalapon 1 lb plus 4-(MCPB) amine 1/2 lb/A, and fair control was obtained with dalapon 1 lb plus DNBP amine 1 lb/A. Fair weed control was reported for DNBP amine at 2 and 4 lb/A, and dalapon at 1 and 2 lb/A. Good control of wild mustard was reported from Winnipeg, Manitoba, with the salts and amine of MCPA at 3 or 4 oz/A, DNBP amine at 1½ lb/A, and with 4-(MCPB) and 4-(2,4-DB) at 2 lb/A. Reasonable control of lamb's quarters was obtained at Lethbridge, Alberta, with salts and amine of MCPA at 8 oz/A, and with the sodium salt of 4-(MCPB) at 16 oz/A.

Abstracts

Weed control in field peas with herbicides. Brown, D.A. The Arthur variety was used. The experiment had two divisions: (1) pre-emergence applications of Giegy 444E (2-chloro-4,6-bis(diethylamino)-S-triazine), and CIPC (isopropyl N-(3-chlorophenyl)carbamate) at 6 and 9 lb/A. (2) post-emergence applications at two stages of growth (4 and 8 inches) of MCPA (2-methyl-4-chlorophenoxyacetic acid) at 4 and 6 oz/A; DNBP (4,6-dinitro ortho sec butylphenol) at 1 and 1½ lb/A; dalapon (2,2-dichloropropionic acid) at 1 lb/A plus MCPA at 4 oz/A, and dalapon at 1 lb/A plus DNBP at 1 lb/A. Results: The pre-emergence treatments gave yields of peas equal to or better than the untreated checks. CIPC gave fair to good control of annual grass weeds but poor control of broadleaved weeds. Giegy 444E provided excellent weed control and enhanced the yield of peas. Among post-emergence treatments, MCPA slightly thinned the stand and set back growth reducing the yield (not significantly), and gave unsatisfactory weed control. DNBP had no depressing effect on yield but gave poor weed control. The mixture of dalapon and MCPA gave fair weed control but significantly reduced the yield of peas. The mixture of dalapon and DNBP delayed the crop, gave poor weed control, and significantly reduced yield. Higher yields and better weed control were obtained from post-emergence treatments

applied at the 8-inch than the 4-inch stage of growth. Giegy 444E (pre-emergence) gave the most satisfactory results. Rates showed no appreciable differences. (Contribution from Experimental Farm, Brandon, Manitoba.)

Post-emergence applications of herbicides for control of grassy weeds in canning peas. Buchholtz, K.P. Plots 3 by 12 feet in a planting of Early Perfection peas were treated on June 7 when the peas were from 2 to 4 inches tall. The area was heavily infested with *Setaria* seedlings, with some lamb's quarters, and with a few other broadleaved weed seedlings. Materials applied in 20 gallons of spray were diuron as wettable powder and suspended preparations, dalapon, DNBP as an amine salt, 4-(4-MCPB) as an amine salt, and several combinations of the above. Estimates of grass growth were obtained on June 13. The peas were harvested on July 17. Weights of shelled peas and tenderometer readings were secured.

Material	lb/A	Grass growth index[1]	Shelled pea yield - lb/A	Tenderometer readings
Dalapon + 4-(4-MCPB)	1 + 0.5	6.3	3310**	140
DNBP	4	1.8	2757*	126**
DNBP + dalapon	1 + 1	4.3	2749*	132*
Dalapon	1	5.8	2725*	133
Dalapon	2	5.5	2466*	147
DNBP	2	3.5	2450	130*
Diuron suspension	1	6.0	2434	135
Diuron wettable	1	5.5	2286	127**
Diuron suspension	2	4.5	2258	127**
Diuron + dalapon	1 + 1	2.5	2046	127**
Diuron + 4-(4-MCPB)	1 + 0.5	3.5	1860	126**
Diuron + DNBP	1 + 1	2.8	1684	125**
Diuron + dalapon	1 + 0.5	3.8	1647	118**
Check	-	8.5	2030	143
LSD 5% level		-	658	10.6
LSD 1% level		-	882	14.2

[1] 10 = normal growth, 0 = no growth.

The grass growth indexes show that DNBP gave rapid control of the grasses when applied at 4 lb/A. This index was not valid when dalapon was used for this herbicide stunted the seedlings so that they did not compete with the peas, but it did not kill them rapidly. In a number of instances good control of both grassy and broadleaved weeds resulted from combination treatments. The mixture of dalapon and 4-(4-MCPB) was particularly outstanding for plots treated with this combination gave the highest yields of peas but did not differ from check plots in tenderometer readings. DNBP at 2 and 4 lb/A, dalapon at 1 and 2 lb, and the mixture of DNBP and dalapon also gave increases in yields of shelled peas over check. Applications of diuron delayed the maturity of the peas noticeably, and yields might have been considerably greater if plots treated with this material had been harvested when the maturity was comparable. (Dept. of Agronomy, University of Wisconsin, Madison, Wisconsin.)

Comparison of herbicides for control of wild mustard in peas. Friesen, G., and Andersen, E.T. Several forms of MCPA, 4-(MCPB), 4-(2,4-DB) and two forms of DNBP were compared at several rates of application for control of wild mustard (Brassica kaber) in Little Marvel peas. Treatments 1-17 in table were applied in 10 gal of spray per acre and 18-23 in 40 gal/A. 1-21 were post-emergence treatments, 22 and 23 pre-emergence. The following table summarizes the results:

Treatment No.	Chemical Form	Rate per acre	Control of Wild Mustard	Injury to Peas*
1	MCPA - sodium salt	3 oz	excellent	10
2	"	6 "	"	10
3	MCPA - potassium salt	3 "	good	10
4	"	6 "	excellent	10
5	MCPA - Na and K salt	2 "	fair-good	10
6	"	4 "	good-excellent	10
7	MCPA - amine	2 "	excellent	10
8	"	4 "	"	7
9	MCPA - oil-free ester	2 "	very poor	8
10	"	4 "	fair	6
11	MCPA - ester (butyl)	2 "	good	5-6
12	4-(MCPB)	1 lb	fair	10
13	"	2 "	good	8
14	"	4 "	excellent	4
15	4-(2,4-DB)	1 "	fair	9
16	"	2 "	good-excellent	7
17	"	4 "	excellent	1
18	DNBP (ammonium salt)	3/4 "	fair	9
19	"	1½ "	good-excellent	9
20	DNBP (alkanolamine)	3/4 "	fair	10
21	"	1½ "	excellent	10
22	DNBP (alkanolamine)	3 "	none	10
23	"	6 "	"	10

* 0 = killed out or very seriously damaged.
5 = retarded or deformed.
10 = no injury.

The MCPA salts, MCPA amine, and DNBP alkanolamine, all applied post-emergently, were the only treatments which gave complete control of mustard without noticeable injury to the peas. (Contribution of the Division of Plant Science, University of Manitoba, Winnipeg, Manitoba.)

Control of annual grasses in processing peas with pre-emergence applications of herbicides. Nylund, R.E., and D.C. Nelson. Canning peas (variety #39) seeded on May 14 in silt clay loam soil at Farmington, Minnesota, were sprayed on May 17 with the following twenty herbicides: 4 and 6 lb CDAA; 2 lb diuron; 2 lb monuron; 2 and 4 lb neburon; 3, 6, and 9 lb alkanolamine salt of DNBP; 4 and 6 lb tris-(2,4-dichlorophenoxyethyl) phosphite (E.H. #3Y9); 4 and 8 lb CDT; 8 lb CIPC; 6 lb sodium salt of dalapon; 1.5 lb 2,4-dichlorophenoxyacetamide (2,4-D emid); 4 lb 2,4-dichlorophenoxyethanol (2,4-D ethanol); 3 lb DNBP plus 2 lb CDAA; 4 lb CDT plus 4 lb E.H. #3Y9; and 3 lb DNBP plus 4 lb E.H. #3Y9. Each of the above was applied at 30 psi pressure in 40 gal water/A

to duplicated one-half square rod plots. Each sprayed plot was adjacent to an unsprayed control plot. At the time of application, no weeds were emerged and peas had not started to germinate. The soil surface was dry, temperature was 66°F. No rain fell until the eighth day following application when 0.15" precipitation was recorded. Temperature during this period averaged 1 to 2 degrees above normal. The principal weeds present in the plot area were Setaria spp. Data taken approximately one month after application indicated that the following six herbicide treatments were effective in controlling annual grasses (80% to 95% control): 4 and 6 lb CDAA, 2 lb diuron, 2 lb monuron, 9 lb alkanolamine salt of DNBP, and the mixture of 3 lb alkanolamine salt of DNBP with 2 lb CDAA. All others failed to give acceptable grass control and/or caused excessive pea injury. (Paper No. 3626 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station.)

Control of annual weeds in processing peas with post-emergence applications of herbicides. Nylund, R.E., and D.C. Nelson. Canning peas (variety #39) seeded on May 14 in silt clay loam soil were sprayed on May 29 with the following herbicides: 1, 1.5, and 3 lb alkanolamine salt of DNBP; 0.3 lb diethanolamine salt of MCPA; 0.5 and 1 lb diethanolamine salt of 4-(MCPB); 0.5 and 1 lb isooctyl ester 4-(2,4-DB), and all possible combinations of 0.5 and 1 lb dalapon with 0.3 lb MCPA, with 0.5 and 1 lb 4-(MCPB), and with 0.5, 1, and 1.5 lb DNBP. Each of the above herbicides was applied at 30 psi pressure in 40 gal water/A to duplicated one-half square rod plots. Each plot was adjacent to an unsprayed control plot. At the time of application, the principal weeds present (Setaria spp.) were 1" to 1½" tall and in the partially expanded two-leaf stage. Peas were 2" to 3" tall and had 2 nodes above ground. The soil surface was moist (0.35" rain fell on the day before spraying); temperature was 70°F. Precipitation following spraying amounted to 0.12" on May 31, 0.08" on June 1, and 0.60" on June 7. Temperatures during this period averaged approximately 2 degrees above the normal 60° to 65°F. Data taken two weeks after application indicated that only six of the herbicides used gave satisfactory grass control (60-80%) and only slight pea injury. These were: 1 and 1.5 lb DNBP, 0.5 lb dalapon plus 1.5 lb DNBP, 1 lb dalapon plus 1.5 lb DNBP, 1 lb dalapon plus 0.5 lb MCPB, and 1 lb dalapon plus 1 lb MCPB. DNBP at 3 lb gave slightly better grass control than those listed above but caused excessive pea damage. The other herbicides gave relatively poorer grass control but, in general, did not cause serious injury to the peas. The butyrics (MCPB and 2,4-DB amine and ester) at 0.5 lb/A caused less injury to peas than 0.3 lb MCPA. At 1 lb/A, the butyrics tended to delay pea flowering slightly. (Paper No. 3627 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station.)

Effect of several herbicides used for control of broadleaf annual weeds in canning peas. Sexsmith, J.J. A late seeding of Climax peas was made on June 4, 1956, on a silty clay loam irrigated soil. Duplicate plots were treated on July 10 with the following herbicides: dimethylamine of 2,4-D, sodium salt of MCP, mixed sodium and potassium salt of MCP, potassium salt of MCP, triethanolamine of MCP, and butyl ester of MCP, all at 4, 8, and 12 oz/A; and sodium salt of 4-(MCPB) at 8, 16, and 24 oz/A. All applications were made at a solution rate of 21.2 gal/A. Because of unavoidable circumstances the treatments were delayed, and when treated the peas were variable from 8 to 14 inches tall in the vegetative stage, and red-root pigweed (Amaranthus retroflexus) and lamb's quarters (Chenopodium album) were up to 3 inches tall. Injury ratings on peas and control ratings for the weeds were taken three weeks after treatment. The stand of the pea crop was relatively poor and non-uniform and, therefore, yield

samples were not taken. However, maturity notes were taken. Results: As determined on July 31, injury to the peas was severe with the ester of MCP, moderate with the amine of 2,4-D, and light with the sodium salt of 4-(MCPB) and the MCP formulations other than the ester. Maturity delays at the highest application rate were noted as being approximately 12 days with the ester of MCP, 6 or 7 days with the amines of 2,4-D and MCP, and 4 to 5 days with the other types of MCP and the sodium salt of 4-(MCPB). Weed control ratings indicated little difference in effectiveness for the various chemicals at the highest rate, although best control of both weed species was obtained with the ester of MCP. All chemicals gave better control of lamb's quarters than of red-root pigweed. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.)

Pre-emergence weed control in canning peas. Switzer, Clayton M. Triplicate 25-foot plots of W.R. Perfection canning peas were sprayed 4 days after planting by means of a CO_2 pressurized sprayer. Spray chemicals were applied in aqueous solution at the rate of 40 gal/A directly over the row to cover one foot on each side. Peas were harvested at an average tenderometer reading of 80. Average weed counts and yields of marketable pods are summarized below.

Treatment[1]		Average Weed Count per Sq. Ft. of Plot		Average Yield Wt. of Marketable Pods per 25-ft. Row	
		No. Weeds	% of Control	Wt. Pods (gm)	% of Control
Check		49	100	746	100
Cultivated check		0	-	775	103
Amino triazole	3 lb/A	17	34	547	73
Natrin	3 lb/A	31	63	706	94
Natrin	4 lb/A	32	65	734	98
DNBP	4 lb/A	12	24	860	115
DNBP	6 lb/A	7	14	807	108
Dalapon	4 lb/A	41	83	226	30
CIPC	4 lb/A	34	69	805	107
MCP (amine)	1 lb/A	23	46	632	84
KCN	8 lb/A	29	59	1137	152

[1] All rates are expressed in terms of active material.

It is apparent that DNBP at either rate was the most effective pre-emergence chemical tested in controlling weeds in peas. MCP and amino triazole reduced weed stand more than 50%, but at the rates used also reduced yield. Marked formative effects on the peas were brought about by dalapon with corresponding yield reduction. No explanation is offered for the 50% increase in yield of plots sprayed with KCN. (Contributed by the Dept. of Botany, Ontario Agricultural College, Guelph, Ontario.)

Post-emergence weed control in canning peas. Switzer, Clayton M. Triplicate 25-foot plots of Perfection canning peas were sprayed 10 days after emergence (plants 4-6 inches in height) with the following herbicides: 0.5 lb 2,4-D (amine), 0.5 lb MCP (Na, K salts), 0.5 lb 2,4-DB (Na salt of 2,4-dichlorophenoxybutyric acid), 0.5, 1.0, and 1.5 lb of MCPB (butyl ester of 2-methyl-4-chlorophenoxybutyric acid), 1.0 and 1.5 lb of Tropotox (Na salt of MCPB), 1.0 and 1.5 lb of a 1:7 mixture of MCP (amine) and MCPB (amine), 1.0 and 1.5 lb of a 1:3 mixture of MCP (amine) and MCPB (amine), 1.0 and 1.5 lb of DNBP. Rates

are expressed as pounds of active material per acre, and all were applied in aqueous solution at 40 gal/A. Weed control and crop injury were estimated two weeks after treatment (cool, wet weather prevailed during this period). The following treatments gave good weed control but resulted in marked injury to the crop: 1.0 and 1.5 lb MCPB (butyl ester), 1.5 lb of the 1:7 and of the 1:3 mixtures of MCP (amine) and MCPB (amine). Tropotox gave some weed control at both 1.0 and 1.5 lb and had little effect on the peas. 2,4-D, 2,4-DB, MCP, and DNBP did not affect the crop but gave poor weed control. None of the chemicals tested gave satisfactory weed control without injury to the crop. (Contributed by the Dept. of Botany, Ontario Agricultural College, Guelph, Ontario.)

<u>Pre-emergence treatments for control of grassy annual weeds in peas</u>. Szabo, S.S., and Buchholtz, K.P. Early Perfection peas were planted May 18, 1956, in an area heavily infested with <u>Setaria</u>. Applications of herbicides were made on May 24 before the weed or pea seedlings had emerged from the soil. The treatments, applied to plots 12 feet long and 5 rows wide, were replicated four times. Water equivalent to 20 gal/A was used. Estimates of the grass stands were made on two dates. The plots were harvested on July 17, with yields being taken from the middle three rows of each plot. Tenderometer readings were also taken but the differences proved to be non-significant.

Treatment	lb/A	Shelled peas lb/A	Grass stand index[1] June 7	Grass stand index[1] June 25
DNBP	8	3,481**	2.5	2.3
Dalapon	2	3,360**	5.0	4.0
TCA	6	3,260**	4.3	2.3
CDAA	4	3,227**	1.0	1.0
Diuron	2	3,216**	1.5	1.5
DNBP	6	2,865**	4.3	4.3
CDEC	4	2,766**	3.3	4.5
Dalapon	4	2,727**	5.0	2.3
DNBP	4	2,685**	5.8	5.5
Diuron	1	2,654**	2.5	2.8
Neburon	2	2,478	5.3	5.8
Neburon	4	2,370	4.8	5.0
CDT	4	2,354	5.8	4.5
Check	-	2,061	9.0	9.3
LSD 5% level		428	-	-
LSD 1% level		523	-	-

[1] 10 = Complete stand, 0 = No stand.

All treatments, with the exception of CDT and neburon, yielded significant increases in yields of shelled peas when compared with the untreated check plots. The best treatments were DNBP at 8 lb/A, dalapon at 2 lb, TCA at 6 lb, CDAA at 4 lb, and diuron at 2 lb/A. These treatments were not significantly different from each other. With the exception of dalapon at 2 lb/A, the stands of grass were relatively low in all of these treatments. When observed on June 25, foliar injury to the peas from the treatments was very slight or non-existent. (Dept. of Agronomy, University of Wisconsin, Madison, Wisconsin.)

Vegetable "Root Crops"

Summary   E. K. Alban

Potato: Pre-emergence treatments with the alkanol amine salts of DNBP continued to provide good control of broadleaf weeds. Combinations of DNBP with dalapon, and with CDAA, and with CIPC provided good to excellent grass as well as broadleaf weed control. Additional chemicals showing promise in pre-emergence treatments included monuron, E.H. No. 3Y9, and CDT. Excellent control of wild oats was obtained with CDAA as a pre-emergence treatment.
Post-emergence treatments using sodium TCA and dalapon at 4.0 lbs./a were reported to have caused serious reductions in potato yields. This is contrary to results previously reported. Tolerance of potatoes to CDAA, applied as a post-emergence spray, was re-affirmed. Lay-by treatments using Simazin and Geigy 444 provided reasonably good grass control without injury to potatoes.

Onion: CIPC continued to receive favorable reports on weed control and crop tolerance. Mixtures of CIPC with sodium TCA, monuron, or CDAA, were also reported as generally favorable. Of the newer chemicals, CDAA was most frequently mentinned as an increasingly important onion herbicide. Liquid cyanamid and Herbisan were also reported as providing good weed control when used as a pre-emergence herbicide.
Costs of weeding studies were reported in one abstract, with monuron providing the cheapest weed control, mixtures of monuron and CIPC next, and CIPC next. All chemical weed control sprays included in this study were more effective and provided cheaper weed control as compared with the hand-weeded check plots.

Carrots: Monuron, diuron, CIPC, and sodium TCA, alone or in combinations provided good weed control with no apparent crop damage. CDAA and CDEC, while providing good to excellent weed control generally resulted in excessive damage to carrots when used as a pre-emergence spray.

Beets: CDAA, CDEC, and endothal were reported as providing good to excellent weed control with no apparent crop injury. Mixtures of CDAA with sodium TCA or with DCU also resulted in good weed control with no damage to the beets. In another study, CDAA was found to be rather toxic to beets and only CDEC of the chemicals used gave satisfactory weed control with no crop damage.

Abstracts

Potatoes

Effects of certain herbicides used as lay-by sprays with potatoes on weed control and crop damage. Alban, E. K. Katahdin potatoes were planted May 10, in a Brookston silt loam and were cultivated and weeded through July 26. Duplicate 100 ft. plots were then marked off and the following herbicides were applied as directed sprays (eighteen inches on each side-row); 0.5, 1.0, and 2.0 lb./a rates of 1-n-butyl-3-(3,4 dichlorophenyl)-1-methylurea, Neburon; 1.0 and 2.0 lb./a rates of 2-chloro-4,6-bis (ethylamino)-s-triazine, Simazin; 5.0 lb./a rate of 2-chloro-4,6-bis (diethylamino)-s-triazine, Geigy 444; and a combination of 0.5 lb./a of amine salt of 2,4-D and 4.0 lb./a of sodium TCA. None of the above chemicals at any of the rates used resulted in visible damage to the potato foliage. Examination of potatoes at time of harvest and four weeks after storage did not reveal any apparent detrimental effects from the treatments. Setaria and Digitaria species were predominant in this planting although there were some pigweed, galinsoga, and purslane present. The 0.5 and 1.0 lb. rates of Neburon did not provide adequate weed control and the 2.0 lb. rate was effective for only about four weeks. The 1.0 and 2.0 lb. rate of Simazin provided fair to good grass control through the harvest period. The 5.0 lb. rate of Geigy 444 provided fair grass control for four weeks but did not hold through the harvest period. The mixture of amine salt of 2,4-D and the sodium TCA provided fair weed control for a short period but weed development by October 5, 1956, harvest date, was not appreciably better than the untreated check plots. (Horticulture Department, Ohio Agr. Exp. Station, Wooster, Ohio.)

Chemical weed control in potatoes. Freeman, J. A. This experiment is a follow-up of previous tests conducted in 1954 and 1955, and was designed primarily to assess the value of CDAA and CDEC. In previous tests DNBP amine, dalapon and a combination of these chemicals proved valuable as pre-emergence herbicides for potatoes. On June 13, 1956 the following treatments were applied just as the potatoes had started to emerge: dalapon 10 and 15 lb./a, dalapon 10 lb. plus DNBP amine 4 lb./a, DNBP amine 6 lb./a, CDAA 3, 6 and 9 lb./a, and CDEC 3, 6 and 9 lb./a. Both weeded and unweeded control plots were included. The Green Mountain variety was used in this test as in previous tests. The soil was a heavy clay and the season was dry. All treatments were applied with a power sprayer at the rate of 40 gal./a and 40 psi. The dominant weeds were couch grass (Agropyron repens), water foxtail (Alopecurus geniculatus), smartweed (Polygonum persicaria), lamb's quarters (Chenopodium album), plantain (Plantago major and lanceolata), and prostrate knotweed (Polygonum aviculare). RESULTS: As in previous years, dalapon controlled couch grass and DNBP amine controlled broadleaf weeds. The combination dalapon plus DNBP amine resulted in slightly poorer control of couch grass (80%), but controlled broadleafs 100%. Dalapon and all rates of CDAA gave 100% control of water foxtail. CDEC was not as effective with ratings being 60, 70 and 80% control for the 3, 6 and 9 lb./a rates respectively. Neither CDAA nor CDEC had any effect on couch grass. Other seedling grasses were controlled by dalapon 10 lb./a, CDAA 9 lb./a, and CDEC 9 lb./a. CDAA 9 lb./a showed fair control of broadleafs (70%), both CDEC and dalapon being poorer. Total weight of potatoes in the unweeded, CDAA 3 and 6 lb./a, and CDEC 3 and 6 lb./a plots was significantly lower than in the cultivated control plots. There were no differences between the other treatments. In general, marketable weight tended to be related to weed population, i.e., the greater the number of weeds the poorer the marketable yield. There was no significant difference in marketable weight in dalapon 15 lb./a, DNBP amine 6 lb./a, and cultivated plots. Marketable yields from all other plots were significantly lower than those of the cultivated plots, but all yields were higher than those of the unweeded check plots. (Canada Experimental Farm, Agassiz, B. C.)

Herbicidal control of green foxtail and wild oats in potatoes. Friesen, George and E. T. Anderson. Several chemicals were applied as a spray in 40 gal. of solution per acre to Pontiac potatoes growing in heavy silt-clay soil. Dalapon at 2 lb./a and TCA at 4 lb./a applied post-emergently each gave good control of green foxtail, no control of wild oats and seriously reduced potato yields. Pre-emergence treatments with DCU at 10 lb./a, 2,4,5-TES at 3 lb./a, and CDAA at 3 lb./a produced results similar to dalapon and TCA except that the CDAA gave, in addition, good control of wild oats. IPC applied pre-planting, at 4 lb./a produced good control of wild oats.but no control of green foxtail and greatly reduced yields of tubers. Neither DCU nor CDAA produced apparent effects on potato top growth whereas all other chemicals, in addition to reducing yields also produced marked stunting of the potato top growth. (Contribution of the Division of Plant Science, University of Manitoba, Winnipeg.)

Pre-emergence weed control in muckland potatoes, 1956. Nylund, R. E. and D. C. Nelson. Kennebec potatoes planted in muck soil on April 19 were sprayed on May 21 (potato plants 10-15% emerged) with the following herbicides: 6 and 9 lb. alkanolamine salt of DNBP; 8 lb. dalapon; 2 lb. monuron; 10 lb. sodium salt of TCA; 8 lb. CIPC; 8 lb. tris-(2,4 dichlorophenyoxyethyl) phosphite (E.H. No. 3Y9); 8 lb. CDT; 4 lb. CDAA; 6 lb. DNBP plus 10 lb. TCA; 6 lb. DNBP plus 8 lb. dalapon; 6 lb. DNBP plus 4 lb. CDAA; 6 lb. DNBP plus 4 lb. CIPC; 2 lb. monuron plus 10 lb. TCA; 2 lb. monuron plus 8 lb. dalapon; 4 lb. CIPC plus 4 lb. E.H. No. 3Y9; 4 lb. CIPC plus 4 lb. CDAA; 4 lb. CDT plus 4 lb CDAA; and 4 lb. CDT plus 4 lb. E.H. No. 3Y9. All herbicides were applied at 30 psi pressure in 80 gal. water/a to 18-foot single row plots replicated 5 times. On the day of herbicide application weeds were few and in the cotyledon stage, temperature was 77° F.; soil was moist but with a crusted surface. The six days preceding spraying averaged 60° F.; those following spraying averaged 64° F. and no rain fell until May 28 when 0.52" was recorded. Sixty percent of the weeds present were annual broad-leaved weeds and forty percent were annual grasses. DNBP at 6 lb./a gave 91% weed control, and at 9 lb./a gave 96% weed control. DNBP in combinations gave the same control as it did alone, with the DNBP-CDAA mixture giving 99% control. Other herbicides which gave good weed control were: 2 lb. monuron (76%), CIPC plus CDAA (84%), CDT plus CDAA (81%), and CDT plus E.H. No. 3Y9 (80%). Although CIPC alone and in combinations with other herbicides caused some injury as indicated by the appearance of the potato plants two weeks after herbicide application, neither these treatments nor any of the other herbicides applied reduced yields of potatoes. (Paper No. 3628 of the Scientific Journal Series of the Minnesota Agr. Exp. Station.)

Onions

Costs of weeding onions with and without herbicides. Nylund, R. E. and D. C. Nelson. Brigham Yellow Globe onions seeded in muck soil on April 19 were sprayed when necessary with monuron at 1.6 lb./a, 8 lb. CIPC, or with a combination of 0.8 lb. monuron plus 4 lb. CIPC. Plots were cultivated when necessary. One set of plots sprayed with the above herbicides was hand-weeded in the row when necessary and one set was left unweeded except for the normal cultivation. Hand-weeded and unweeded checks were also included. Each of the eight treatments was applied to plots four rows wide replicated five times. All hand-weeding was done by one person and was timed with a stopwatch. Data on hand-weeding time, stand, and yields of onions were recorded for the center two rows of each plot. Herbicides were applied

three times: pre-emergence, at the one-leaf stage, and at the 4-5 leaf stage. Unsprayed plots had to be hand-weeded three times (170 hours per acre total). Sprayed plots were hand-weeded twice (the first hand-weeding not being necessary) with total hand-weeding time as follows: monuron - 51 hours, CIPC - 107 hours, monuron plus CIPC - 79 hours. Principal weed species present were barnyard grass (Echinochloa crusgalli) and purslane (Portulaca oleracea). With labor at $0.70 per hour, the most effective treatment (monuron) reduced weeding costs from $119 per acre to $58 (including herbicide cost but not cost of application). No marketable onions were obtained from the unweeded checks but the unweeded sprayed plots produced approximately 40% that of the yield from the hand-weeded controls. In terms of yields from the hand-weeded check plots, the hand-weeded sprayed plots produced as follows: monuron - 81%, CIPC - 97%, and monuron plus CIPC - 82%. On a statistical basis, none of these yields was significantly below that of the check. Stands of onions were not affected by the herbicide treatments. (Paper No. 3624 of the Scientific Journal Series of the Minnesota Agr. Exp. Station.)

Pre-emergence weed control in muckland onions, 1956. Nylund, R. E. and D. C. Nelson. Brigham Yellow Globe onions seeded in muck soil on April 19 were sprayed on May 7 (onions began emerging on May 11) with the following herbicides: 4 and 6 lb./a CDAA, 4 lb. neburon, 8 lb. CIPC, 4 and 8 lb. CDT, 1.6 lb. monuron, 7.3 lb. DCU, 4 lb. CDAA plus 4 lb. CDT, 4 lb. CDAA plus 0.8 lb. monuron, 2 lb. CDAA plus 0.8 lb. monuron, 4 lb. CDAA plus 4 lb. CIPC, 2 lb. CDAA plus 4 lb. CIPC, 0.8 lb. monuron plus 4 lb. CIPC, 4 lb. CDEC plus 4 lb. CDT, 4 lb. CDEC plus 0.8 lb. monuron, and 4 lb. CDT plus 4 lb. tris-(2,4 dichlorophenoxyethyl) phosphite (E.H. No. 3Y9). Each of the herbicides was applied at 30 psi pressure in 80 gal. water per acre to 18-foot single-row plots replicated five times. Temperature on application date was 68° F. and soil was moist (0.47" rain on May 5). Temperatures for the week following application averaged 60° F., and 0.91" rain fell 4 days after application (May 11). Weeds which emerged after application were predominantly (77%) annual grasses: Setaria spp; and Echinochloa crusgalli. Weed counts taken one month after application showed that 4 lb. CDAA had given 90% weed control and 6 lb. CDAA 96% weed control. Mixtures of CDAA with other herbicides were no more effective than CDAA alone. With grasses present as the principal weed species, the other herbicides tested were much less effective than CDAA. Only two herbicides significantly reduced onion yields. These were 4 lb. neburon (28% yield decrease) and the mixture of 0.8 lb. monuron and 4 lb. CIPC (13% yield decrease). (Paper No. 3629 of the Scientific Journal Series of the Minnesota Agr. Exp. Station.)

The use of pre-emergence herbicides in onions and carrots. Rake, Leo and LeRoy Holm. Brigham Yellow Globe onions and Red-cored Chantenay carrots were planted in a moist organic soil on May 21 in a five replication randomized block experiment. Pigweed (Amaranthus retroflexus), smartweed (Polygonum hydropiper), purslane (Portulaca oleraceae) and crab-grass (Digitaria spp.) were the principal weeds in the area. The chemicals were applied 3 days after planting. There was no rain during the 7 days following planting, after which one inch of rain fell in three days. This in turn was followed by a 2 week period without rain. Stand counts of crops and weeds were made 4 weeks after planting. The crop was weed-free for the entire season. The effectiveness of each chemical was measured on weed plots adjacent to the crop within each replication. The following chemicals were applied (all concentrations are in pounds per acre of acid equivalent or active ingredient of the appropriate compound): CDAA (2-chloro-N,N-diallylacetamide) 6; CDEC (2 chloroallyl diethyldithiocarbamate) 6; CDT (2-chloro-4,6-bis(diethylamino)-s-triazine) 4; 2,3,6-TBA (2,3,6-trichlorobenzoic acid) 2; CIPC (isopropyl-N-(3-chlorophenyl)carbamate) 8; sodium salt of TCA (trichloroacetic acid) 8; E.H. No. 3Y9

(tris-(2,4 dichlorophenoxyethyl) phosphite) 2; DCU (dichloral urea) 10; monuron (3-(p-chlorophenyl)-1,1-dimethylurea) 1; neburon (3-(3,4-dichlorophenyl)-1-methyl-1-n-butylurea) 2 and 4.

With the exception of DCU, 3Y9, neburon, and CDT, all chemicals reduced weed stands significantly as follows: CDAA 55%, CDEC 65%, 2,3,6-TBA 70%, CIPC 60%, monuron 60%, and TCA 25%. TCA was particularly effective against grasses and smartweed; monuron and neburon against purslane. There were no significant reductions in stands and yields of the crop with the exception of the serious injury to onions by 2,3,6-TBA and to carrots by CDAA and CDEC.

In addition, the following chemical mixtures were applied: monuron 1 with TCA 8, CIPC 8, CDAA 6, 2,3,6-TBA 1, CTD 4, or DCU 8; diuron (3-(3,4-dichlorophenyl)-1,1-dimethylurea) 1 with CIPC 8 or CDAA 6; and CIPC 8 lbs. with stoddard solvent at 50 gallons per acre. All of these mixtures provided 60 to 80% weed control. There were no significant reductions in stands or yields of the crop with the exception that all CDAA applications were harmful to the carrots. (Department of Horticulture, Wisconsin Agr. Exp. Station, Madison, Wisconsin.)

<u>The effect of several herbicides on onions.</u> Waywell, C. G. (A) Autumn Spice onions were sown at the Muck Research Station (O.A.C.) on May 15, 1956. Treatments as shown in Table 1 were applied on May 22, two to three days before onion emergence. The plots consisted of three 25-foot rows with two rows treated and one guard row. A simple randomized block design with three replicates was used. Four weeks after treatment weed counts in randomly-placed one-square-foot areas, estimates of weed ground cover, and onion stand counts per row were made. On September 22 the onions were harvested and weighed.

Table 1 The effect of herbicides on onions. Muck Research Station (O.A.C.), 1956.

Treatment	Rate	Weed Count 3 sq. ft. quadrats	Weeds % Ground Cover	Onion Stand /row	Onion Yield lbs./row
CIPC	3 lbs/a	44	17	114	16.00
CIPC	5 llbs/a	25	12	114	14.08
CIPC	8 lbs/a	18	12	94	13.33
CIPC Granular	5 lbs/a	37	12	99	12.17*
CIPC Granular	8 lbs/a	22	7	107	11.16*
Herbisan (1)	2 gal/a	139	37	178	18.33
	4 gal/a	32	5	169	15.33
5521 (2)	4 gal/a	66	12	151	12.17*
	8 gal/a	19	6	126	14.33
Liquid Cyanamid	25 gal/a	13	1	125	13.00
Check	--	107	100	160	16.98

*LSD @ 5% Level 4.13

(1) Herbisan - bis(ethyl xanthic) disulfide.
(2) 5521 - (1-chloropropyl-2)N(3 chlorophenyl) carbamate.

All CIPC treatments, Liquid Cyanamide, and 5521 at 8 lbs/A caused reduction in onion stand. This reduction was not reflected in reduced yields in all cases. Under the conditions of the experiment only three of the treatments significantly reduced yields. While the differences were not statistically significant increasing the rates of CIPC resulted in a reduction in yield. Weed control was good with all treatments except Herbisan at 2 gal/A. In order of success the other treatments were Liquid Cyanamid, Herbisan at 4 gal/A, CIPC Granular at 8 lbs/A, 5521 at 8 lbs/A, CIPC at 5 and 8 lbs/A, and CIPC Granular at 5 lbs/A. (B) Observational plots of CDAA (a-chloro-N-diallylacetamide at 3 and 6 lbs/A indicated that CDAA at 6 lbs/A caused a slight reduction in stand but both rates controlled weeds for over a month. Similar plots of 3Y9 (tris-(2-4 dichlorophenoxyethyl) Phosphite) caused severe reduction in onion stand and controlled weeds for a period in excess of six weeks. (Contributed by Dept. of Botany, Ontario Agricultural College, Guelph, Canada).

Carrots

A study of weed control in muckland carrots with pre-emergence application of herbicides. Nylund, R. E. and D. C. Nelson. Nantes carrots seeded in muck soil on April 19 were sprayed on May 7 with the following herbicides: 4 lb neburon, 4 and 8 lb CIPC, and 4 and 8 lb CDT. On this date neither weeds nor carrots were emerged, although the latter had sprouts to 3/4" long. On May 10, when many weeds had emerged, the following herbicides were applied to other plots in the same planting: 80 gal. Stoddard solvent, 4 lb CIPC plus 40 gal. Stoddard solvent, and 4 lb CDT plus 40 gal. Stoddard solvent. Soil moisture was high preceding both dates of application and 0.91" rain fell one day after the second date (May 10). Temperatures averaged 2 to 3 degrees above normal during the week following application. Weed counts made in each of five replications on June 4 showed no significant differences between weed populations in the control and treated plots. Only 4 lb neburon, 4 and 8 lb CIPC, and 8 lb CDT appeared to have reduced weed populations to any extent (35-50% control). Carrot yields were not affected by any of the herbicide treatments. (Paper No. 3630 of the Scientific Journal Series of the Minn. Agr. Exp. Sta.)

Beets

Pre-emergence herbicides for weed control in red beets on organic soil. Rake, Leo and Holm, LeRoy. Detroit Dark Red beets were planted in a moist organic soil on May 21 in a four-replication randomized block experiment. Pigweed (*Amaranthus retroflexus*), smartweed (*Polygonum hydropiper*), purslane (*Portulaca oleracea*), barnyard grass (*Echinochloa crus-gali*), and crab-grass (*Digitaria spp.*) were the predominant weeds in the area. A total of 1 inch of rain fell in a 3 day period beginning on the date of the seeding. On the fourth day the chemicals were applied. No rain fell for the 16 days following. Stand counts of weeds and beets were made 4 weeks after emergence. Yield data were obtained in early September from plots which had been cultivated and hand weeded for the entire season. The effect of the chemicals on the weeds was studied in areas adjacent to the crop within each replicate. The following chemicals were applied (all concentrations are in pounds per acre of acid equivalent, or active ingredient, of the appropriate compound): CDEC (2-chloroallyl diethyldithiocarbamate) 6; CDAA (2-chloro-N, N-diallylacetamide) 6; 3Y9 (tris-(2,4-dichlorophenoxy ethyl phosphite) 2; neburon (3-(3,4-dichlorophenyl) 1-methyl-1-n-butylurea) 2 and 4; DCU (dichloral urea) 10; sodium salt of TCA (trichloroacetic acid) 10; disodium salt of endothal (3,6-endoxohexahydrophthallic acid) 8; sodium salt of dalapon (2, 2-dichloropropionic acid) 6.

The following chemicals reduced weed stands significantly without injury to the crop: CDAA 65%, CDEC 30%, and endothal 30%. It is believed that 3Y9 was used at a rate too low to test its effectiveness on this crop and soil.

In addition the following chemical mixtures were applied: DCU 10 with CDAA-4, with 3Y9-2, or with diuron (3-(3,4-dichlorophenyl)-1, 1-dimethylurea) 3/4; and TCA - 8 with CDAA-4, with 3Y9-2, or with diuron-3/4. Significant over-all weed stand reductions of 75% were recorded for the mixtures of CDAA with TCA, or with DCU. There was no injury to the crop.

CDT (2-chloro-4,6-bis(diethylamino)-S-triazine) and 2,3,6-TBA (2,3,6-trichlorobenzoic acid) were included in the experiment and proved to be very toxic to the beets. (Department of Horticulture, University of Wisconsin, Agricultural Experiment Station, Madison, Wisconsin).

Pre-emergence herbicide treatments on red beets. Welker, W. V. and Holm, L. G. Detroit Red beets were planted in a Miami silt loam soil in a four replicated randomized complete block test. The pre-emergence sprays were applied the same day at a rate of 40 gallons per acre, using a pressure of 30 psi. No rainfall occurred for the first week after which .93 of an inch fell during a three day period. This was followed by three weeks without rain. The area was irrigated twice during this period. The beet plots were maintained weed free throughout the experiment. Data on the weeds were obtained from adjacent weed plots receiving the same treatments. The predominant species present in the weed plots were: pigweed (Amaranthus retroflexus), purslane (Portulaca oleracea), and foxtail (Setaria spp.). The following chemicals were applied: TCA (trichloroacetic acid) 10, DCU (dichloral urea) 10, endothal 3,6-endoxohexahydrophthallic acid) 8, CDAA (2-chloro-N, N-diallylacetamide) 3 and 6, CDEC (2-chloroallyl diethyldithiocarbamate) 3 and 6, neburon (3-(3,4-dichlorophenyl)-1-methyl-1-n butylurea) 2 and 4, 2,3,6-TBA (2,3,6-trichlorobenzoic acid) 1/2 and 1, 3Y9 (tris-(2,4-dichlorophenoxyethyl) phosphite) 2 and 4, and CDT (2-chloro-4,6-bis (diethylamino)-S-triazine) 1-1/2. All rates are expressed in pounds of active ingredient per acre. Applications of neburon, CDT, 3Y9, XTB, and CDAA 6 resulted in serious injury to the beets. Among the treatments which the crop could tolerate, only CDEC 6 gave satisfactory weed control when used alone. This treatment reduced weed stands by 80%. (Department of Horticulture, University of Wisconsin, Agricultural Experiment Station, Madison, Wisconsin).

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Other Vegetables

Summary S. K. Ries

Snap Beans. The following treatments gave effective weed control without causing injury when applied prior to emergence: 3 and 6 lbs. 444 (2 reports), 4 and 6 lbs. CDAA (2 reports), .75 lb. Monuron (2 reports), 6 lbs. CDEC (2 reports), 4 and 6 lbs. DNOSBP, 4 lbs. Alanap-3, 2 lbs. 580, 3 lbs. CDEC plus 3 lbs. DNOSBP, and 4 lbs. CDAA pl us 4 lbs. CDT. The following showed promise when applied post-emergence: 4 lbs. DNOSBP, 4 lbs. Neburon, 6 lbs. 7355, and 1 lb. ACP-119.

Lima Beans. The following treatments gave effective control without causing injury to lima beans: .75 lb. Monuron, 3 lb. NPA, 6 lbs. CDEC, 4 lbs. Neburon, 2 to 4 lbs. 3Y9, 4 lbs. CDT, 2 lbs. Simazin, and 8 lbs. 444.

Cucumbers. One report noted a varietal susceptibility of pickling cucumbers to rates of 6 and 12 pounds of NPA applied pre and post emergence. In the other report, there were no differences in injury or weed control between different forms of NPA. One new treatment, 4 lbs. CDEC, gave effective weed control without causing injury when applied before emergence.

Sweet Corn. In one test, the following treatments gave excellent weed control without causing injury when applied in the spike stage: 4 lbs. Simazin, 2 lbs. X33, 2 lbs. X80, and 4 lbs. Randox plus 1 lb. 2,4-D amine. In the other test reported, 3 lbs. DNOSBP and 3, 6, and 9 lbs. of CDAA gave good weed control without causing injury when applied before emergence.

Other Crops. Abstracts are included which give information on celery, tomatoes, vegetable greens, and miscellaneous crops. Due to the diversity of the information contained in these, they cannot be satisfactorily summarized, and the reader is referred to the individual abstracts.

Abstracts

Beans

Pre-emergence weeding of snapbeans with herbicides. Alban, E.K. Three randomized, replicated plantings of Tendergreen snapbeans were made on Brookston silt loam soil on June 8, 21, and July 6, 1956. The alkanolamine salts of DNOSBP at 4.0 and 6.0 lbs./a; Simazin, 2-chloro-4,6-bis (ethylamino)-s-triazine at 0.25, 0.50, 1.0 and 2.0 lbs./a; Geigy 444, 2-chloro-4,6-bis (diethylamino)-s-triazine, at 3.0, 4.0, 6.0, and 8.0 lbs./a; Alanap 3, sodium N-napthyl phthalate, at 2.0 and 4.0 lbs./a; Neburon, 1-n-butyl-3-(3,4-dichlorophenyl)-1-methyl urea, at 0.5 lb./a; CDAA, 1-chloro-N-N-diallyl acetamide at 6.0 lbs./a; were applied four days after planting as pre-emergence treatments. None of the chemicals used, with the exception of the three highest rates of Simazin and the 4.0 lbs./a rate of Alanap 3, resulted in damage to the snapbeans. Highest yields of beans were obtained from the weeded check plots, Geigy 444, and the DNOSBP plots. Satisfactory weed control was obtained with the two highest rates of Simazin and Geigy 444, both rates of DNOSBP, the 4.0 lbs./a rate of Alanap 3, and the 6.0 lbs./a rate of CDAA. Major weeds in the plots included Setaria and Digitaria sp., Portulaca oleraceae, Amaranthus retroflexus, and Galinsoga parviflora. (Department of Horticulture, Ohio Agr. Exp. Station, Wooster, Ohio.)

Pre-emergence weed control in bush beans grown on muck soil, 1956. Nylund, R. E. and D. C. Nelson. Topcrop bush beans seeded in muck soil on May 7 were sprayed on May 11 (no beans or weeds emerged on this date) with the following

herbicides: 1.6 lb monuron; 4 lb neburon; 8 lb CDT; 6 lb alkanolamine salt of DNBP; 4 lb CDAA; mixtures of 0.8 lb monuron with 4 lb CIPC, 6 lb DNBP, 2 lb ATA, or 4 lb CDAA; 4 lb CIPC plus 6 lb DNBP; and 4 lb CDAA plus 4 lb CDT. Each herbicide was applied to single-row plots 18' long replicated five times. All were applied in 80 gal. water/A at 30 psi pressure. At the time of herbicide application, the temperature was 71°F. and the soil moisture was high (0.91" rain fell the previous night). Temperatures for the 6 days preceding application averaged 54°F. and for the 6 days following, 56°F. No rain fell following application until May 28 when 0.52" was recorded. Weed population in the plot area consisted 60% of broadleaved weeds and 40% annual grasses. Three of the herbicides gave significantly better weed control than the others. These were: 0.8 lb monuron plus 4 lb CDAA (83%), 4 lb CDAA plus 4 lb CDT (83%), and 4 lb CDAA alone (79%). All of the herbicides gave good control of broadleaved weeds, but the above three also gave excellent grass control. Inasmuch as none of the herbicides caused visible injury to the bean plants, yields were not recorded. (Paper No. 3625 of the Scientific Journal Series of the Minn. Agr. Exp. Sta.)

Pre- and post-emergence weed control on snap beans. Ries, S.K. Two pre-emergence tests and one post-emergence test were conducted using the variety Improved Tendergreen. The predominant weeds present in all tests were pigweed (Amaranthus retroflexus), lambs quarters (Chenopodium album), purslane (Portulaca oleracea), foxtail (Setaria sp.), and crabgrass (Digitaria sp.) The first pre-emergence test was seeded May 28, 1956 in a sandy loam soil and the following treatments, expressed in pounds per acre, were applied the same day: 6 lb DNOSBP, 4 lb CIPC, 4 lb Randox (a-chloro-N,N-diallylacetamide), 3 and 6 lb CDEC (2 chloroallyl diethyldithiocarbamate), 3 and 6 lb 444 (2-chloro-4,6-bis diethylamino-s-triazine), 3 lb CDEC plus 3 lb DNOSBP, 6 lb 7355 (nitro aryl derivative), 8 lb 9500 (cyclohexyl derivative), and 4 lb Alanap-3 (NPA). Weed control ratings made June 13 indicated that the following treatments resulted in excellent weed control: 6 lb CDEC, 3 and 6 lb 444 and 3 lb CDEC plus 3 lb DNOSBP. Six lb 444 and 8 lb 9500 reduced the yield. A second pre-emergence test was seeded July 9 and treated July 10 with the following chemicals: 4 and 8 lb CDEC, 4 and 8 lb 444, 4 and 8 lb 7355, 2 lb 580 (MCP butyric amine), and 2 lb ACP-119 (MCP butyric acid). The best weed control was obtained with 3 and 6 lb 444 and 2 lb 580. Visual injury ratings indicated that 6 lb 444 severely injured the beans. The post-emergence test was seeded May 28 and the following treatments applied as an over-all spray on June 5, when the beans were in the crook stage: 4 lb DNOSBP, 6 lb 7355, 8 lb 9500, 8 lb 9501 ((cyclohexyl derivative), 8 lb 9436 (cyclohexyl derivative), 1 and 2 lb ACP-119, 1 lb 580, 3 lb CDEC plus 4 lb DNOSBP, 2 lb Neburon, and 4 lb DNOSBP plus 2 lb Neburon. Excellent weed control was obtained with 6 lb 7355, 2 lb ACP-119, 3 lb CDEC plus 4 lb DNOSBP, 2 lb Neburon plus 4 lb DNOSBP, and 4 lb DNOSBP. The beans grew exceptionally well and the yield was not reduced by any treatment. (Department of Horticulture, Michigan State University, East Lansing, Michigan).

Pre-emergence herbicide treatments on beans. Welker, W.V. and Holm, L.G. Tendergreen snap beans and Thorogreen lima beans were planted on June 4 in a Miami silt loam soil in a four replicated randomized complete block experiment. The pre-emergence sprays were applied the same day at a rate of 40 gallons per acre using a pressure of 30 psi. No rainfall occurred during the next two weeks after which 2 inches fell in two days. The area was irrigated twice during the first two weeks. The bean plots were maintained weed-free throughout the experiment. Data on the weeds were obtained from adjacent weed plots receiving the same treatments. The predominant species present in the weed plots were: pigweed (Amaranthus retroflexus), purslane (Portulaca oleracea), and foxtail (Setaria spp.). The following chemicals were applied: Monuron (3-(p-chlorophenyl)-1, 1-dimethylurea) 3/4, CIPC (isopropyl N-

(3-chlorophenyl) carbamate) 4, NPA (N-1-naphthyl phthalamic acid) 3, DNBP (4, 6-dinitro ortho secondary butylphenol) 8, CDAA (2-chloro-N, N-diallylacetamide) 3 and 6, CDEC (2-chloroallyl diethyldithiocarbamate) 3 and 6, Neburon (3-(3,4-dichlorophenyl) - 1 - methyl - 1 - n butylurea) 2 and 4, 3Y9 (tris- (2, 4-dichlorophenoxyethyl) phosphite) 2 and 4, and CDT (2 - chloro - 4, 6-bis (diethylamino) - S - triazine) 4. All rates are expressed in pounds of active ingredient per acre.

The following treatments gave significant weed control without injury to the lima beans; Monuron 78%, NPA 82%, CDEC 6 79%, Neburon 4 83%, 3Y9 82%, CDT 93%. Applications of NPA, CDT, and 3Y9 resulted in serious injury to the snap beans. The following mixtures also were applied: Monuron 3/4 with CIPC 4, DNBP 8, or CDAA 3; and CDAA 3 plus Neburon 2. None of these treatments reduced the yield of either the snap beans or lima beans. The weed control from the mixtures ranged from 82% for Monuron with DNBP to 99% for Monuron with CDAA. (Department of Horticulture, University of Wisconsin, Agricultural Experiment Station, Madison, Wisconsin).

Pre-emergence weeding of lima beans with herbicides. Alban, E.K. Two randomized, replicated plantings of lima beans, Fordhook 242, were made on Brookston silt loam on June 8 and 21, 1956. The alkanolamine salts of DNOSBP at 6.0 lbs./a; Simazin, 2-chloro-4, 6-bis (ethylamino)-s-triazine at 1.0, and 2.0 lbs./a; Geigy 444, 2-chloro-4,6-bis (diethylamino)-s-triazine at 4.0 and 8.0 lbs./a; CDAA, 1-chloro-N-N-diallyl acetamide at 6.0 lbs./a; Alanap 3, sodium N-1-napthyl phthalate at 2.0 lbs./a; and U.S. Rubber 3Y9, tris-(2,4-dichlorophenoxyethyl) phosphite, at 2.0 lbs./a; were applied four days after planting as pre-emergence treatments. None of the chemicals used caused any visible symptoms of damage on the beans, nor were there any statistically significant differences in bean yields which could be associated with chemical damage. Excellent weed control was obtained with Simazin at 2.0 lbs./a and Geigy 444 at 8.0 lbs./a. Good weed control was obtained with the 6.0 lbs./a of DNOSBP, 4.0 lbs./ a of Alanap 3, and the 6.0 lbs/a rate of CDAA. The low rate of Alanap 3 and the 3Y9 as used did not provide satisfactory control. Major weeds in the plots included Setaria and Digitaria sp., Portulaca oleraceae, Amaranthus retroflexus, and Galinsoga parviflora. (Dept. of Horticulture, Ohio Agr. Exp. Station, Wooster, Ohio)

Cucumbers

Chemical weed control in pickling cucumbers. Freeman, J.A. and Magel, H.A. The prime purpose of this experiment was to study the varietal response of pickling cucumbers to NPA (Alanap-3). Six varieties of pickling cucumbers were sown on June 23 on a Monroe silt loam. Varieties included were Yorkstate, Chicago, Ohio MR17, Snows, National and Packer. The following pre-emergence treatments were applied on June 29: NPA 4, 6 and 12 lb/A. A further two plots in each replicate were tested as follows: NPA 6 lb/A pre-emergence followed by 4 and 6 lb/A post-emergence. An additional plot in each replicate received only a post-emergence treatment of NPA 6 lb/A. Post-emergence application was delayed until August 3 due to insufficient weed growth prior to this date. All varieties had started to blossom. Treatments were applied in 40 gal at 40 psi. A rainfall of 1 in was recorded on August 1. The rest of the season was dry. Weed control was satisfactory for all treatments; the lower rates giving 75-80% control and higher rates 90%. The post-emergence treatments initially checked the growth of all varieties and plant foliage took on a silvery appearance. This condition was outgrown but maturity delayed slightly. There was no difference in total yield under any of the treatment

for Snows pickling and National pickling. Post-emergence treatments reduced the yield for Yorkstate pickling, Chicago pickling and Ohio MR 17. With Ohio MR 17 being most affected and Yorkstate the least. Packer was the least tolerant of the varieties to NPA with all treatments causing a yield reduction as compared to the cultivated check plots. (Canada Experimental Farm, Agassiz, B.C.)

A comparison of pre- and post-emergence applications of new herbicides with Alanap-1 on pickling cucumbers. Ries, S.K. Pickling cucumbers, variety SMR-12, were seeded in a sandy loam soil June 11, 1956. The following pre-emergence treatments (expressed in pounds per acre) were applied June 13: 4 lb Alanap-1 (NPA), 4 lb Alanap-3 (NPA), 2 lb Neburon, 4 lb Randox (a-chloro-N,N-diallylacetamide), 4 lb CDEC (2 chloroallyl diethyldithiocarbamate), 6 lb 7355 (nitro aryl derivative), and 6 lb 7355 plus 6 lb DCU. Weed control ratings were taken on June 25. The following treatments gave commercially acceptable control of pigweed (Amaranthus retroflexus), lambs quarters (Chenopodium album), purslane (Portulaca oleracea), and foxtail (Digitaria sp.): 4 lb Alanap-1, 4 lb Alanap-3, 2 lb Neburon and 4 lb CDEC. The only chemical which reduced the yield was 2 lb Neburon. The following post-emergence treatments were applied as an over-all spray July 9, as the cucumbers were starting to vine: 4 lb Alanap-1, 4 lb Alanap-3, 4 lb Alanap-20 (Pelleted), 1 lb ACP-119 (MCP butyric acid), 6 lb 7355, 8 lb 9500 (cyclohexyl derivative), and 8 lb 9436 (cyclohexyl derivative). Due to dry soil conditions, none of the treatments gave commercially acceptable control of the predominant weed species, purslane (Portulaca oleracea). The yield was reduced by the following treatments: 1 lb ACP-119, 6 lb 7355, and 8 lb 9500. (Department of Horticulture, Michigan State University, East Lansing, Michigan.)

Sweet Corn

PRE-EMERGENCE weed control in Marcross corn. Freeman, J. A. and Magel, H.A. Marcross corn was sown on June 25 at Agassiz on a Monroe silt loam. DNBP amine 3 lb/A, and CDAA 3, 6 and 9 lb/A were applied on June 29, 6 days before the corn emerged. Treatments were applied with a power sprayer at the rate of 40 gal/A and 40 psi. Air temperature was 65°F at time of application. One inch of rainfall was recorded between the time of seeding and treatment. Principal weeds present were horsetail (Equisetum arvense), and spurrey (Spergula arvensis), barnyard grass (Echinochloa crus-galli), pigweed (Amaranthus retroflexus). DNBP amine gave the best weed control rating 80% control , while the CDAA treatments were rated 40 to 60%. Both chemicals stunted and checked horsetail. The 9 lb/A rate of CDAA was required to completely control corn spurrey. There was no differences in yield between treated and control plots. (Canada Experimental Farm, Agassiz, B.C.)

A Comparison of New Herbicides with Standard Treatments on Sweet Corn. Ries, S.K. Sweet corn, variety Tendermost, was seeded in a sandy loam soil May 28, 1956 and treated June 4 in spike stage with the following herbicides expressed in pounds per acre: 4 lb DNBP, 1 lb 2,4-D (amine), 4 lb Randox (a-chloro-N,N-diallylacetamide) plus 1 lb 2,4-D (amine), 2 lb Emid (2,4-D amide), 2 lb TBA (trichlorobenzoic acid), 2 lb X33 (polychlorobenzoic acid), 2 lb X80 (polychlorobenzoic acid), 2 lb ACP-M-103-A (trichlorobenzoic acid), 2 and 4 lb Simazin (2-chloro-4,6-bis ethylamino-s-triazine), 2 lb 3Y-9 (trio-2-4 dichlorophenoxyethyl phosphite), 6 lb 7355 (nitro aryl derivative), 8 lb 9500 (cyclohexyl derivative), 8 lb 9501 (cyclohexyl derivative), and 8 lb 9436 (cyclohexyl derivative). Weed control ratings were made June 13 and August 16. The corn was harvested August 14. The weed population consisted of pigweed (Amaranthus retroflexus), lambs quarters (Chenopodium album), purslane (Portulaca oleracea), foxtail (Setaria sp.) and crabgrass (Digitaria sp.) The soil

was moist at time of treatment and weather conditions were ideal for sweet corn. None of the treatments reduced the weight or number of ears. The coefficients of variability were only 12.9 and 14.5 percent respectively for these observations. There was no reduction in maturity by any treatment. Early weed control, observed nine days after treatment, was excellent for all treatments except 8 lb 9501, 2 lb Simazin, 2 lb 3Y9 and 8 lb 9436. After-harvest weed control was still exceptionally good from the following treatments: 4 lb Randox plus 1 lb 2,4-D (amine), 2 lb X33, 2 lb X80 and 4 lb Simazin. (Department of Horticulture, Michigan State University, East Lansing, Michigan).

Other Crops

The effect of several herbicides on celery. Waywell, C.G. A simple randomized block design using three replications was used to test several of the butyric acid compounds on celery. Plants of Utah (Salt Lake) celery were treated on August 1st one week after transplanting using an over-all spray. Treatments included 2,4-D Butyric ester, 2,4-D sodium salt, MCP butyric ester, MCP sodium salt, and checks. All chemicals were applied at 12, 16, 24, and 32 ounces acid/A. Examination of the plots on August 11 and September 10 revealed some leaf symptoms similar to those typical of 2,4-D injury in those plots treated with 2,4-DB at 32 oz./A. This injury was not found in the leaves produced after treatment. On October 1 the celery plants were harvested by cutting level with the ground surface. Total weight of untrimmed celery was obtained and weed counts were made of all weeds on a 12 in. strip centered over the row. All treatments significantly reduced weed stand (Chenopodium spp., Amaranthus spp., and Senicio vulgaris) with MCPB ester & 2,4-DB ester causing the greatest reduction. Differences in yield of celery were not significant. (Contributed by Dept. of Botany, Ontario Agricultural College, Guelph, Canada).

Effect of 2,4-D on tomatoes. Dabbs, D.H. and Forsberg, D.E. Early Chatham tomato plants, growing in 5 in clay pots, were subjected to a spray of 2,4-D butyl ester on June 29. The plants were approximately 6 in in height and were commencing to bloom. The potted plants were arranged in the field at distances of 0, 2, 4, 12, 24, 48 and 96 rods downwind from the path of the field sprayer. A check treatment was also included. The wind spread was 5-8 mph and the sprayer was operated for thirty minutes at an application rate of 5 oz/A. The plants were transplanted into the garden on July 3. The statistical treatment used was a randomized block design with four replications.

Fruit was set earlier and early growth of fruit was more rapid on plants from the 2, 4, and 12 rods treatments particularly than from the check treatment. All plants from the 0 rods treatment were severely distorted for the first three weeks. Following this date recovery was quite good for replicates 1 and 3.

The yields of ripe fruit and the total yield of fruit was highly significantly lower from the 0 rods treatment than for any other. There were no significant differences in the yields of green fruit. The only treatment that exhibited any significant effect was the 0 rod treatment. Most of the field-ripened fruit from the five treatments closest to the path of the sprayer were seedless and the skin over the entire stem end was severely russeted and often badly cracked. From a market gardener's stand point this would have ruined his sales. (Dominion Experimental Farm, Scott, Sask.)

Weed control in transplanted tomatoes. Warren, G.F. Three replicated

experiments were conducted on silt loam soils and one on a light sandy soil. Georgia-grown tomato plants were sprayed within two days after transplanting using using 50 gal/A of solution. Rainfall during the two weeks after spraying was 1.33 inches on the sandy soil, 4.42 and 4.67 inches on two of the silt loam tests and .01 inches on the other. Weed counts were taken on the following species which were present in one or more of the experiments: crabgrass (Digitaria sanguinalis), foxtail (Setaria spp.), barnyard grass (Echinochloa crus-galli), lamb's quarters (Chenopodium album), pigweed (Amaranthus retroflexus), and carpetweed (Mollugo verticillata). An excellent crop of tomatoes was produced at all locations and the yields at each picking were recorded throughout the season.

In the three experiments where considerable rain followed the treatments the results were as follows: 2,4,5-TES (Natrin) gave good control of the above weed species at 4 lb/A and fair to good control at 2 lb. However, it caused injury to the tomatoes and a significant reduction in early yield at both rates at all locations and on the sandy soil it also reduced the total yield. Injury was more severe at the 4 lb rate and in the experiment on sandy soil. DCU at 4 and 8 lb/A gave good control of the annual grasses on sandy soil and in one of the tests on silt loam but poor control in the other. Results on the other weed species present were poor in all cases. On the silt loam the 4 lb application resulted in no apparent damage to the tomatoes, while 8 lb caused slight injury. On the sandy soil, DCU caused stunting, chlorosis and reduced yields at both rates. Neburon was included in the experiment on sandy soil and gave good control of all weeds present at 2 lb/A and excellent control at 4 lb. No injury was detected at the lower rate and only slight stunting at the higher one. CDAA was included in one of the tests on a silt loam where it gave good control of the annual grasses and fair control of lamb's quarters at 6 lb/A. Weed control was not as good at 3 lb/A. The tomatoes showed no injury or yield reduction from either rate of application.

In the experiment on silt loam soil where dry weather followed the treatments the results were as follows. DCU at 6 lb/A did not control any of the weeds present while neburon at 2 and 4 lb gave no grass control but did give good results on pigweed and carpetweed. CDAA at both 4 and 8 lb killed almost 100% of the grasses, pigweed and carpetweed indicating relatively better performance of this herbicide under dry conditions. None of these herbicides caused any measurable injury to the tomatoes, however, in a supplementary test 6 lb of CDAA produced considerable leaf burning.

Based on the results of these and other experiments it is suggested that neburon, CDAA and possibly DCU should be tested further for weed control in transplanted tomatoes. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana).

Weed control in vegetable greens. Singletary, C. C. and Herron, J.W. Pre-planting treatments were made on plots to be seeded with kale, spinach and turnips. The materials used were DNBP 4 lbs/A, CIPC 6 lbs/A and 8 lbs/A, and 3,5-Dimethyltetrahydro-1,3-5,2H-thiadiazine-2-thione (Mylone) at the rate of 200 lbs/A and 300 lbs/A in 100 gals. water per acre. All materials were applied with a knapsack sprayer. Each treatment was replicated 3 times in a randomized block design. The size of each plot was 50 sq.ft.

Mylone was applied on April 9, 1956 and the plots were rototilled to a depth of 4 inches. DNBP and CIPC were applied on May 11. On May 26 the vegetable seeds were broadcast on the plots, and the area was rolled immediately. The turnip greens were harvested on July 3, 1956, in this test. Mylone at the

200 lbs/A and 300 lbs/A rates resulted in highly significant yield increases and decrease in weed growth. The treatments means for yields are as follows: Mylone 200 lbs/A - 36.3 lbs/plot; Mylone 300 lbs/A - 36.1 lbs/plot; Check - 28.1 lbs/plot. The weed growth as measured by weight at harvest is as follows: Mylone 200 lbs/A - 5.5 lbs/plot; Mylone 300 lbs/A - 5.5 lbs/plot; Check - 19.0 lbs/plot.

The kale and spinach on each treated plot was either so severely injured or the germination was inhibited to such an extent that no yield records could be taken. Less than 60% weed control resulted from all treatments in kale and spinach. The turnips were also severely injured by treatments with DNBP and CIPC.

The benefits obtained with Mylone in weed control in turnips are probably a result of the increased growth and stand of the crop crowding out the weeds, since satisfactory weed control was not obtained in the kale and spinach plots. (Kentucky Agricultural Experiment Station, Lexington, Kentucky).

Relative effect of pre-emergence treatments of four herbicides applied to several vegetable crops and annual weeds, 1956. Selleck, G.W. and L. Gelleta. Ten species of vegetables and weeds (which had been planted in rows 2 ft. apart on May 8) were given pre-emergence applications in triplicate of sodium salt of PCP at 2.5, 5 and 10 gal., and stoddard solvent at 20, 40 and 80 gal. of the total product per acre. KOCN and diuron (3-(3,4-dichlorophenyl)-1, 1-dimethylurea) were applied at 8, 16 and 32 lb. and 0.75, 1.5 and 3 lb. respectively of the active ingredient in 8.3 Imp. gal of water per acre. Visual examinations made in July indicated the relative percentage control (or damage) to be as listed below (0 = no effect, 20 = significant damage to vegetables, 60 = satisfactory control, 100 = complete killing) in the average of the three rates applied.

Species	Herbicide			
	Na salt PCP	Stoddard oil	KOCN	Diuron
Corn	50	0	45	0
Beans	26	10	20	0
Peas	16	6	0	0
Beets	0	0	0	38
Carrots	0	0	19	15
Onions	1	0	16	-
Rutabaga	0	7	0	13
Lamb's quarters	68	46	16	46
Red-root pigweed	0	0	0	0
Purslane	0	0	0	0

(Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

250 lbs/A and 500 lbs/A rates resulted in highly significant yield increases and decrease in weed growth. The treatments means for yields are as follows: Nylone 250 lbs/A - 26.3 lbs/plot; Nylone 500 lbs/A - 36.1 lbs/plot; Check - [illegible] lbs/plot. The weed growth as measured by weight at harvest is as follows: Nylone 250 lbs/A - 5.5 lbs/plot; Nylone 500 lbs/A - 3.5 lbs/plot; Check - [illegible] lbs/plot.

The kale and spinach on each treated plot was either so severely injured or the population was inhibited to such an extent that no yield records could be taken. Less than 50% weed control resulted from all treatments in kale and spinach. The turnips were also severely injured by treatments with [illegible] and C.I.P.C.

The benefits obtained with Nylone in weed control in turnips are probably a result of the increased growth and stand of the crop crowding out the weeds, since satisfactory weed control was not obtained in the kale and spinach plots. (Kentucky Agricultural Experiment Station, Lexington, Kentucky).

Inhibitory effect of pre-emergence treatments of four herbicides applied to several vegetable crops and annual weeds. [illegible]. Ten species of vegetables and weeds (which had been planted in rows 8 in. apart on May [illegible]) were given pre-emergence applications in [illegible] of cotton soil of pH [illegible], 5 and 11 gals. and stoddard solvent at 20, 40 and 80 gal. [illegible] the total per acre. TCA and chloro [illegible] (3-(3,[illegible]phenyl)-1,1-dimethylurea) were applied at [illegible], 10 and 12 lb. and 0.75, 1.5 and 3 lb. respectively of the active ingredient in 6.5 gal. of water per acre. Visual examinations made in July indicated the relative percentage control (or number) to be expected below (0 = no effect, 20 = significant damage to vegetables, 60 = satisfactory control, 100 = complete killing) in the average of the three rates applied.

Species	Herbicide [illegible]	oil	[illegible]	[illegible]
Corn	20	0	10	0
Beans	25	10	20	0
Peas	15	5	0	0
Beets	0	0	0	30
Carrots	0	0	10	10
Lettuce	-	0	25	-
[illegible]	0	7	0	15
Lamb's quarters	40	15	10	14
Redroot pigweed	0	0	0	0
Purslane	0	0	0	0

[Dept. of [illegible], [illegible], [illegible], and [illegible] United States [illegible]]

FRUITS

Summary D. D. Hemphill

Apples. In an experiment to control vegetation around young apple trees CPCPC (1-chloropropyl-2) N-(3-chlorophenyl) carbamate), Simazin (2-chloro-4,6-bis (ethylamino)-S-triazine) and 3Y9 (tris-(2,4-dichlorophenoxy-ethyl) phosphite gave satisfactory weed control for the season without detectable injury. Erbon caused leaf modification and marginal burn.

Cranberries. Iron sulphate and MH treatments appeared promising in an experiment to control sensitive fern (Onoclea sensibilis L.) in cranberry bogs. Iron sulphate gave immediate kill of fern fronds and MH prevented regrowth the current season, and markedly reduced recovery the following season.

Grapes. CIPC and CPCPC (1-chloropropyl-2) N-(3-chlorophenyl) carbamate) continued to give satisfactory control of annual weeds. Diuron controlled weed growth for the season without detectable injury on young transplants.

Strawberries. 2,4-DES, 2,4,5-TES, 3Y9 (tris-2,4-dichlorophenoxyethyl) phosphite), 2,4-dichlorophenoxyethanol and neburon were used for the control of weeds in new plantings.

Irrigation immediately after 2,4-DES applications appeared to increase injury from this herbicide as expressed by formative effects.

Neburon applications at rates adequate for satisfactory weed control resulted in considerable injury.

Abstracts

Weed control around young apple trees. Hemphill, D. D. To reduce hand cultivation several herbicides were evaluated for use around 2 yr. old apple trees of mixed varieties. An area approximately 6 ft x 6 ft was hand spaded around each tree. The cultivated area was then covered lightly with a hay mulch to reduce erosion and the herbicidal sprays applied over the mulch. Following chemicals and rates were used: CIPC 14 lb/A, CPCPC (1-chloropropyl-2) N-3-chlorophenyl) carbamate) 14 lb/A, Dalapon 2 lb/A, Erbon 10 lb/A, Dinitro fortified oil spray (20 gal diesel oil + 2 qt DNBP in 100 gal)-100 gal/acre, Simazin 4 lb/A and 3Y9 (tris-(2,4-dichlorophenoxyethyl) phosphate) 4 lb/A.

CPCPC, Simazin, 3Y9, and Erbon gave satisfactory weed control for the season, however Erbon treated trees showed leaf modification and marginal burn. (Contribution Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

Sensitive fern control in cranberries. Dana, Malcolm N. Sensitive fern (Onoclea sensibilis L.) occurs frequently in cranberry bogs in patches ranging in size from a few square yards to as much as an acre. Limited control has been obtained by spraying with saturated iron sulphate solution or by packing fern clumps with handfuls of dry iron sulphate.

Treatments applied July 26, 1955 to duplicate plots were MH 10 lb/A; triethanolamine salt of 2,4-D .5 lb/A; ATA 1 lb/A; iron sulphate 900 lbs/A. The first 3 materials were applied in 40gpa of water while iron sulphate was

applied in 435gpa of water. Saturated iron sulphate solution was also applied in combination with the other 3 materials. Cranberry fruit was half grown and the annual upright growth was nearly completed for the season.

Iron sulphate alone or in combination killed all fern fronds with slight cranberry foliage injury. Triethanolamine salt of 2,4-D alone or with iron sulphate killed the tips of cranberry uprights and prevented fruit bud formation. MH alone showed no effect on vines and did not injure fern fronds. ATA alone did not show effects on vines or ferns.

Regrowth of ferns following iron sulphate knockdown was as follows: iron sulphate, iron sulphate plus triethanolamine salt of 2,4-D, and iron sulphate plus ATA - 100% regrowth of ferns; iron sulphate plus MH no regrowth of ferns.

Examination of fern rhizomes in October showed that dormant frond initials on MH treated plants were elongated, pointed, and horizontal as opposed to short, upright, curled initials on untreated plants.

In 1956 there was 100% fern recovery in all but the MH treated plots. In the MH alone plot no fern fronds emerged until mid-August when a few short, weak, small fronds appeared. In the MH plus iron sulphate plot the regrowth occurred a month earlier but the fronds were small, very short, and weak. Cranberry vines developed normally in all plots. (Department of Horticulture, University of Wisconsin)

<u>Chemical weed control in grape vineyards.</u> Hemphill, D. D. Chemical weed control experiments were continued for the 7th year in a grape vineyard of mixed varieties. During this period various chemicals have been compared with dinitro fortified oil and the following have been eliminated as inferior in weed control properties or as injurious: Endothal, 2,4-DES, NPA, and fenuron.

In 1956, CIPC-14 lb/A, CPCPC (1-chloropropyl-2) N-(3 chlorophenyl) carbamate) 14 lb/A and diuron 2 lb/A were compared with dinitro fortified oil spray. Diuron was substituted for monuron and applied to the same plots that had been treated with monuron the four preceding seasons.

Crabgrass (<u>Digitaria spp</u>) and foxtail (<u>Setaria spp.</u>) were the predominant weed species. One application of CIPC, CPCPC, and Diuron gave satisfactory weed control for the season. Young transplants were present in this vineyard and there was no evidence of injury from any treatment. Diuron appears to be safer than monuron which has usually caused chlorosis of leaves of young transplants. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri.)

<u>2,4-DES injury to strawberries in relation to irrigation.</u> Dana, Malcolm N. 2,4-DES applications were made to a replicated planting of strawberries of the variety Robinson. The soil type was Plainfield sand, a very light sand. Application rates were 1, 2, and 4 lbs/A. Single applications were made to separate plots at 2 wks, 3 wks, and 4 wks after planting. One series of plots was treated twice at 2 wks and 6 wks after planting. One half inch of supplemental irrigation was applied 18 hours before herbicide application to all plots. Following herbicide treatments 1/2 of the treated plots received an additional 1/2 inch of irrigation water immediately while the other 1/2 received no sprinkler irrigation or rainfall for 5 days.

The total number of runner plants formed were counted July 11 (3 weeks after the last herbicide application and 7 wks after the first application). Two lbs/A and 4 lbs/A of 2,4-DES reduced the number of runner plants below the number in control plots at all dates of application. Irrigation immediately following herbicide application resulted in a significant reduction in number of runner plants in comparison with non-irrigated plants at the 4 lbs/A rate. At the 2 lower rates of herbicide application the plants receiving the post

herbicide application irrigation produced as many or more runners than the non-irrigated plots.

The period of time between planting and treatment had no influence on the total number of runner plants.

On the extremely light soil in which this planting was located 1 lb/A of 2,4-DES controlled weeds satisfactorily. Two lbs/A was slightly better for weed control but resulted in a considerable retardation of early runner formation.

Irrigation immediately following 2,4-DES application on strawberries reduced the margin of safety for 2,4-DES application. Formative effects due to 2,4-DES injury were more prevalent on irrigated plots at all rates of herbicide application than on non-irrigated plots. (Department of Horticulture, University of Wisconsin)

Chemical weed control in strawberries. Denisen, E. L. The following materials and rates were applied to cultivated spring planted strawberries on July 19: SES-4 lb/A; New Process SES-4 lb/A; granular 2,4-dichlorophenoxyethanol (A.C.P.-M83) 2 lb/A and 3 lb/A; liquid 2,4-dichlorophenoxyethanol (C.&C.-E. H. 5247)-2 lb/A; and tris-(2-4 dichlorophenoxyethyl) phosphite (U.S.R.-3Y9)-4 lb/A. Severe drouth conditions prevailed during and following application. Approximately 1/4 in of water was applied to the experiment following treatment. Excellent control of pigweed was obtained with all treatments. About 70% control of purslane was obtained with all herbicides. Grasses were least effectively controlled perhaps because they germinated from greater depths than the herbicides were able to penetrate. Drouth conditions were probably influential in producing similar results for all these herbicides. Rooting of runners was greatly reduced in all treatments including the check. Drouth is the logical barrier to runner rooting in this experiment. (Department of Horticulture, Iowa State College, Ames, Iowa).

Control of weeds in strawberries. Herron, J. W. and Chaplin, C. E. In 1956, SES, Natrin 80S and Neburon were applied to plots containing Tennessee Beauty strawberry plants. SES and Natrin 80S were used at the rate of 3 lb/A and Neburon at the rate of 2, 4, and 8 lbs/A. All materials were applied on a 2-ft band over rows planted 4 ft apart. The amount of H_2O used was at the rate of 100 gals per acre and was applied with a 1 gal knapsack sprayer. Each treatment was replicated 4 times in a randomized block design. The size of each plot was 12½ ft by 2 ft.

The plants were set on April 14, 1956 and the first applications made April 25. Subsequent applications were made June 18 and August 9.

Results with SES and Natrin were similar to those reported previously. Weed control was satisfactory and no significant reduction in runner production or rooting was noted. Results with Neburon were variable. Weed control at the higher rates was satisfactory, but the 8 lbs rate resulted in severe plant injury. There was injury also at 4 lb/A but not so pronounced. The 2 lbs rate gave some chlorosis which was not severe, but weed control was not satisfactory. Thus, the need for further testing at intermediate rates is indicated.

SES (New Process) which was received too late to incorporate into the replicated test was applied to a 50-ft. row at the rate of 3 lbs/A on June 18 and August 9. Weed control was excellent. Although not substantiated by proper replications, there seemed to be a definite stimulation to early rooting. (Contribution of Kentucky Agricultural Experiment Station).

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ORNAMENTAL NURSERIES, FOREST NURSERIES, SHELTERBELTS, AND ALL OTHERS

Summary J. P. Mahlstedt

Reports concerned with the control of herbaceous weeds and grass in ornamental nurseries, forest plantings, shelterbelts, and tobacco transplant beds were received from four stations.

Soil moisture conditions as they influence or otherwise alter the morphological and/or physiological condition of weed seeds apparently are quite important in determining the success or failure of the chemicals classified as soil fumigants.

Established plants of caragana appear to be tolerant to Dalapon up to and including rates of 81#/A. The optimum concentration of Dalapon for the control of couch grass in young, established shelterbelts containing elm and ash appears to be in the range of 27 - 54#/A.

Erbon (2-(2,4,5-trichlorophenoxy)ethyl 2,2-dichloropropionate) applied at the rate of 40#/A to new plantings of poplar cuttings and 3 year-old poplar and pine transplants resulted in satisfactory control of weeds throughout the first growing period without significant injury to the stock. Diuron (3-(3,4-dichlorophenyl)-1, 1 dimethylurea) at the rate of 2#/A gave satisfactory control with only slight injury to pine transplants and none to poplars and older established plantings.

Combinations of Dalapon with low volatile esters of 2,4-D (2#/A) and/or diuron (2#/A), and CIPC (20#/A), as well as CIPC in combination with 2,4-D and diuron gave good grass and weed control in tree breeding nurseries with only slight injury to pine transplants.

Granular Cyanamid (7.5#/100 sq.ft.) and SES (5#/A) applied in the fall to clean cultivated plots without plant materials gave satisfactory control of weeds to late spring. Cyanamid treated plots seeded in late May to hollyhocks were relatively free from weeds, which reduced hand weeding in the row to a minimum. Re-application of SES (4#/A) to weed free plots resulted in satisfactory control of weeds without injury to plants throughout the normal growing season. DNBP (Premerge) at the rate of 4#/A gave satisfactory control of weeds in new seedings of hollyhocks, but significantly reduced stands.

Abstracts

The control of couch grass in field shelterbelts. Friesen, George, and Campbell, J. Dalapon at the rate of 27, 54, and 81 lb/A was sprayed on a heavy couch grass sod in a three-year old field shelterbelt consisting of elm, ash, and caragana near Carberry, Manitoba. Treatments were made in late June, 1956, when the couch grass had produced lush growth. Plots were 272 sq. ft. in size and a knapsack sprayer was used for making the treatments. The 27 lb./A rate of dalapon gave only partial control of couch grass in these plots, but at the same time none of the trees showed evidence of damage. The 54 lb/A rate gave satisfactory control of couch grass but ash and elm trees showed evidence of damage. Caragana, however, showed no visible effects. The 81 lb/A rate resulted in complete kill of couch grass, caused serious damage to elm and ash, but no visible effects on caragana. Further observations will be made in 1957 tree survival. (Soils & Crops Branch, Manitoba Department of Agriculture and The University of Manitoba.)

<u>Weed control in forest plantings</u>. Kuntz, J. E., and A. J. Riker. Replicated plantings of dormant poplar cuttings and poplar, red pine, and Norway spruce transplants were made in May, 1956, on plowed and disked, sand and sand-gravel soils in central Wisconsin. Herbicidal preparations in water were applied at the rate of 100 gallons per acre with hand sprayers so as to avoid tree foliage. Plots were treated only once, either before or after weeds appeared. Similar treatments were applied to older, established plantings. Seasonal rainfall was well distributed and above average, resulting in vigorous weed growth in untreated plots. Final data were taken September 1, 1956. 2-(2,4,5-trichlorophenoxy)ethyl 2,2-dichloropropionate (erbon) at 40 lb/A gave excellent, first-season grass and weed control (few <u>Setaria</u> only) with little injury to new plantings and no injury to 3-year-old poplars and pines. At 20 lb/A, a few weeds persisted. (In 1955, erbon applied at 160 lb/A to plantings on silt loam and muck also gave excellent weed and grass control, but killed all trees.) 3-(3,4-dichlorophenyl)-1, 1 dimethylurea (diuron) at 2 lb/A gave satisfactory, first-season grass and weed control with only slight injury to newly planted pines, but none to poplars and the older plantings. At 4 lb/A, most pine transplants were severely injured. (In 1955, diuron at 4 lb/A caused no injury to trees on heavier soils.) June applications of 2,2-dichloropropionic acid (dalapon) at 10 and 20 lb/A killed all grass foliage without injury to new or old trees. Combinations with low volatile esters of 2,4-dichlorophenoxyacetic acid (2,4-D) at 2 lbs/A and/or diuron at 2 lbs/A gave good grass and weed control with slight injury only to pines. Isopropyl N-(3-chlorophenyl) carbamate (CIPC) at 20 lb/A and the above combinations with 2,4-D and diuron gave similar results. These combinations have been used to reduce weed competition in tree-breeding nurseries. Sodium 2,4-dichlorophenoxyethyl sulfate (2,4-DES) at 4 and 8 lb/A and 2,3,6-trichlorobenzoic acid (Heyden-1281-S) at 4 and 8 lb/A gave good initial weed control especially at the higher rates with only slight injury to pine transplants. The lower rates permitted moderate regrowth of weeds by September. 2-chloro-N, N-diallylacetamide (CDAA) at 8 and 16 lb/A and sodium 2,4,5-trichlorophenoxyethyl sulfate (2,4,5 TES) gave similar but less effective results. (Wisconsin Agricultural Experiment Station in cooperation with the Wisconsin Conservation Department and the Nekoosa-Edwards Paper Company.)

<u>Pre-seeding soil treatments for control of weeds in tobacco plant beds</u>. Kavanaugh, J. M., and Freeman, J. F. A gently sloping area of Hagerstown silt loam soil was plowed, disked, and rototilled October 15, 1955. During the last week of October the area was fitted, a weed seed mixture was sowed broadcast and covered lightly, and 4.5 x 6 ft plots laid out in a randomized block design with three replications. The use of herbicides having short residual phytotoxic effects in the soil were compared both in fall-and in spring-prepared beds. Treatments were: Fall beds only, granular calcium cyanamide at 1 1/2 lb/sq yd and the same + 2 1/2 lb ferric sulphate applied and worked into the soil; fall beds, free cyanamide solution (25% H_2CN_2) at 1/2, 3/4, and 1 pt/sq yd and for spring beds 1/2 and 3/4 pt/sq yd, in water as soil drenches; Fall and spring beds, sodium N-methyl dithiocarbamate dihydrate (Vapam) at 1, 1 1/2, and 2 qt/100 sq ft as soil drench; Fall and spring beds, allyl alcohol 1 qt/100 sq ft as soil drench; Fall and spring beds, methyl bromide 1 lb/100 sq ft as soil fumigant beneath gas proof cover; and untreated check. Fall beds were treated during warm weather the last week of October and spring beds during mild weather March 1, 1956, except for methyl bromide which was treated in warm weather, March 26. Drench materials in water were applied with sprinkling can 1 3/4 gal/sq yd for fall beds and 1 gal/sq yd for spring treated beds. Rainfall amounting to 6 inches fell during the month following spring drench treatments. Ky 16 Burley tobacco was seeded March 27 after proper fertilization of beds. Good seedling stands resulted. Weeds were pulled from each bed and number by species determined. Later, the number of transplantable tobacco plants at each of the three pullings made at 1 week intervals was determined.

Methyl bromide used in spring resulted in best weed control of 98.5% (based on check which had 56 weeds/sq ft) and highest production of early plants - 42/sq ft. Vapam, 1 qt/100 sq ft used in spring was next best with 94.7% weed control and 34 transplants/sq ft. Higher rates of Vapam improved performance only slightly. Allyl alcohol 1 qt/100 sq ft used in spring resulted in slightly better weed control but slightly fewer transplantable plants than did Vapam at equal rate. Methyl bromide in fall did not destroy the recently sown, dry weed seeds and resulted in only 42% weed control in the beds. Vapam and allyl alcohol used in the fall each resulted in approximately 90% control of weeds and slightly improved production of plants over spring treatments. Granular calcium cyanamid gave 95% weed control but only 12 plants/sq ft. Supplementing the treatment with ferric sulphate increased yield of plants to 17/sq ft but reduced control of weeds to 91%. Free cyanamid solution in fall, 3/4 pt sq yd resulted in 91% weed control and in spring 85% and 25 tobacco plants/sq ft in both. Higher rate in fall performed no better and the lower rate in fall or spring resulted in very poor weed control.

In a separate study conducted by W. A. Seay et al. of the Agronomy Department Soils Section, superphosphate 20% grade used at rate of 2 lb/sq yd as a supplement to granular calcium cyanamid at 1 1/2 lb/sq yd in the fall reduced the phytotoxic residues in the soil to the point that by spring excellent production of tobacco transplants was obtained without reduction of weed control effects. (Agronomy Department, Kentucky Agricultural Experiment Station.)

Control of weeds on future perennial planting sites. Mahlstede, J. P. On October 21, 1955 the following treatments were applied to four replicated, 100 square foot plots superimposed on a Webster type soil: CMU(20#/A), Vapam (2 qts/100 sq ft), SES (5#/A), Granular Cyanamid (7.5#/100 sq ft), MC-2 (2#/100 sq ft) and black, pigmented, 1½ mil polyethylene plastic sheeting. The soil temperature at the time of chemical application was 55°F at the 1" level and the soil moisture .6" in the top one foot of soil. Weed control based on the relative density of weeds per plot, and weed counts on May 18, 1956 were as follows: CMU, 100 per cent; Vapam, 33 per cent; SES, 87 per cent; Granular Cyanamid, 100 per cent; MC-2, 16 per cent and polyethylene sheeting, 100 per cent. The lack of weed control from the soil fumigants was attributed to the condition of the weed seed at the time of application as influenced by existing soil moisture conditions. (Department of Horticulture, Iowa Agricultural Experiment Station, Ames, Iowa.)

Control of weeds in newly seeded perennial beds. Mahlstede, J. P. In order to determine the residual qualities of various herbicides, as well as their effectiveness in controlling young weed seedlings, an area was clean cultivated on May 1, 195· This area was then allowed to develop a natural weed population which was composed principally of Setaria spp., Amaranthus spp., and Chenopodium spp.. On May 19th, when this population was relatively young, a three inch strip was clean cultivated in the center of each of four replicated, 100 square foot plots. Into this strip was drilled single, mixed hollyhock seeds at the rate of 16 seeds per foot of row. Immediately after planting the following chemicals were applied to four randomly arranged plots in the design: Dalapon (5#/A), Dalapon (5#/A) plus Stoddard solvent (75 gal/A), Stoddard solvent (75 gal/A), DNBP (Premerge, 4#/A), DNBP (4#/A) plus 2,4-DB (1#/A), 2,4-DB (1#/A), and CIPC (8 qts/A). Weed control based on the total weight of weeds per plot and density of stand in the established weed portions of the plots on June 6, 1956 was as follows: Dalapon, 0 per cent; Dalapon plus Stoddard solvent, 62 per cent; DNBP, 56 per cent; DNBP plus 2,4-DB, 70 per cent; 2,4-DB, 41 per cent; CIPC, 0 per cent. Weed control and per cent hollyhock stands in the three inch planting strip on June 26 were: Dalapon, 0 per cent, 27 per cent stand; Dalapon plus Stoddard solvent, 0 per cent, 30 per cent stand; DNBP, 94 per cent, 29 per cent

stand; DNBP plus 2,4-DB, 79 per cent, 75 per cent stand; 2,4-DB, 0 per cent, 53 per cent stand; CIPC, 52 per cent, 68 per cent stand. (Department of Horticulture, Iowa Agricultural Experiment Station, Ames, Iowa.)

The effect of supplemental irrigation on the growth and control of weeds in perennials. Mahlstede, J. P. A series of plots which had been hand weeded, with the exception of those treated the previous fall, on October 21, 1955 with Granular Cyanamid (7.5#/100 sq ft), CMU (20#/A), and 1½ mil black pigmented polyethylene sheeting were treated with a series of pre-emergence herbicides on June 25, 1956. Single, mixed hollyhocks, seeded at the rate of 16 seeds per foot of row had been planted on May 20, 1956 in each plot. The following chemicals were applied to eight replicated plots, four of which received supplemental irrigation? SES (4#/A, Old Process), SES (4#/A, New Process), and NP (5#/A). During the 50 day lay by period the irrigated plots received a total of 5 inches of water while the non-irrigated plots received a total of 3.46 inches. Although leaf chlorosis was apparent on young hollyhock plants in the NP plots early in the season, the plants reached maturity without noticeable injury. As would be expected there was no germination of hollyhock seeds with progressive seedings in plots treated with CMU.

	PER CENT WEED CONTROL*			
	MAIN PLOT		IN THE ROW	
Treatment	Irrigated	Not Irrigated	Irrigated	Not Irrigated
Polyethylene (SES, 4#/A over the row)	100	100	78	73
SES (4#/A, Old Process)	92	92	84	82
SES (4#/A, New Process)	53	91	48	92
Granular Cyanamid (7.5#/100)	85	76	85	87
CMU (20#/A)	99	100	98	100
NP (5#/A)	96	88	73	76

* Based on weed counts and stands 50 days after chemical application.

(Department of Horticulture, Iowa Agricultural Experiment Station, Ames, Iowa)

Control of Brush on Rangeland and Pastures

Harry M. Elwell

Summary

Abstracts on this subject were received from cooperators in Texas, Oklahoma and Nebraska. The woody species studied were mesquite, sand shinnery oak, salt cedar, dog wood (cornus drummondi) and (cornus stolonifera) oaks, bur, red and white; elm, ash, hackberry, and honey locust.

Herbicides tested for control of eight month old mesquite seedlings were nopyl ester of 2,4,5-T, hydronopyl ester of 2,4,5-T, also the propylene glycol butyl ether ester of 2,4,5-T and 2,4,5-TP. Other herbicides tested on six month old mesquite seedlings were nopyl and hydronopyl esters of MCPA, 2,4-D, 2-(2,4-DP) and 4-CPA. The nopyl and hydronopyl esters of 2,4,5-T produced sufficient effectiveness on mesquite seedlings to warrant future testing of them in field applications. Results of studies, on six month old mesquite seedlings, using triethanolamine salts of 4-(2,4,5-TB), 4-(2,4-DB), 4-(MCPB), and 2,4,5-T indicate that the T and TB were about equal in effectiveness and were superior to the other herbicides.

Aerial foliage applications were made with 2-3-6 trichlorobenzoic acid, on mesquite and sand shinnery oak. Percent top kill from TBA at rates of 1/4, 1/2, 1, and 2 pounds per acre were somewhat lower than from comparable amounts of low volatile 2,4,5-T ester. Oil soluble formulation of TBA appeared more effective than sodium salt formulations.

TBA at 1/2 and 1 pound acid per acre in aerial foliage treatments on sand shinnery oak appeared to be less effective than comparable amounts of 2,4,5-T. Studies with Monuron and Fenuron aerially applied in water suspension at rates of 1.5, 3 and 5 pounds active ingredient of each in 4 gallons water per acre did not appreciably retard the growth of sand shinnery. However, similar rates of Monuron and Fenuron in 25 percent pelleta gave highly effective kills at rates in excess of 3 pounds active ingredient per acre.

Monuron and Fenuron were tested in band or strip treatments approximately 12 inches wide and spaced at intervals of 5, 10, 15 and 50 feet apart. They gave good control of sand shinnery oak at rates of 4 pounds of active ingredient per acre in bands spaced 10 feet apart. All grass plants in the treated bands were killed.

Salt cedar was only slightly affected by Monuron and Fenuron treatments using them in water suspension and in 25 percent pellet forms. In some tests rates of 10 pounds active ingredient per acre were tried. However, good kills on mesquite trees were obtained from rates as low as 4 grams of active 25 percent pelleted Fenuron and Monuron. Diuron was not effective.

A number of aerial foliage tests were made using low and high volatile esters of 2,4,5-TP, 2,4-D and 2,4,5-T plus combinations of 2,4,5-T, TBA, 2,4,5-TP and 2,4,5-T. An application of 2 pounds 2,4-D plus 1 pound 2,4,5-T applied at 3 pounds per acre in 5 gallons of diesel oil followed a year later with the same amount of D & T plus 1 pound of TP gave very effective control of bur, red and white oaks, hackberry, dogwood and honey locust. The same treatment gave only 50% control of elm and ash. Hawthorne and osage orange were eliminated where at least one pound of 2,4,5-T ester per acre was used. Green brier (smilax sp.) was not effectively killed with any of the herbicides tried even at rates totaling eight pounds of acid per acre.

Very effective control of dogwood (cornus drummondi) and (cornus stolonifera) were obtained with an aerial foliage application of low volatile 2,4,5-TP ester at 2 pounds per acre followed a year later with a retreatment using the same amount.

Mesquite was effectively controlled with 1/3 pound of a low volatile 2,4,5-T ester in an oil water emulsion containing 1/2 gallon of diesel fuel and 2 1/2 gallons of water per acre aerially applied in swaths of 60 feet.

The herbicides Monuron, (80 percent wettable powder) and 25 percent pellet of it and Fenuron also low volatile 2,4,5-T ester and Ammate X were applied at several rates to determine their effect on the hay yield of native grasses in a meadow. On the area treated with the low volatile 2,4,5-T ester at 6 pounds per acre there was an increase of forage production. This material produced effective weed control thus apparently permitting more grass development. The Monuron at 6 pounds of commercial 80% wettable powder did not cause a material reduction in the total hay production; however, this material at the rate used did suppress the seedling grasses. Monuron and Fenuron in the 25 percent pelleted form at 8 pounds active ingredient per acre did materially reduce hay production. Ammate X at 50 and 100 pounds per acre suppressed hay production 23 and 35 percent respectively.

Abstracts

<u>Evaluation of halogenated phenoxy butyric acids on mesquite.</u> Behrens, R. and Fisher, C. E. Triethanolamine salts of 4-(2,4,5-TB), 4-(2,4-DB) and 4-(MCPB) were evaluated on six month old mesquite seedlings by dipping plants in 100 ppm acid equivalent in water plus 0.10 percent Vel and allowing the excess solution to drain off. The triethanolamine salt of 2,4,5-T was used as a standard. The leaf kill in percent caused by the various compounds by the 20th day after treatment were as follows: 2,4,5-T, 79%; 4-(2,4,5-TB), 84%; 4-(MCPB), 40%; and 4-(2,4-DB), 34%. Average stem kill per plant was calculated from measurements made 20 days after treatment and were as follows: 2,4,5-T, 7.1 cm.; 4-(2,4,5-TB), 6.5 cm.; 4-(MCPB), 1.2 cm. and 4-(2,4-DB), 1.0 cm. These results indicate that 2,4,5-T and 4-(2,4,5-TB) are about equal in effectiveness on mesquite seedlings while 4-(MCPB) and 4-(2,4-DB) are less toxic. (Contribution of Field Crops Research Branch, ARS, USDA, College Station, Texas and Texas Agricultural Experiment Station, Spur, Texas. Approved for publication by the Texas Agricultural Experiment Station and the Field Crops Research Branch, ARS, USDA.)

<u>Evaluation of terpene derivatives of phenoxy herbicides on mesquite.</u> Behrens, R., Krewson, C. F., Saggese, E. J. and Farquhar, J. Eight month old mesquite seedlings were used to evaluate the herbicidal potentialities of several terpene derivatives of halogenated phenoxy acids which were synthesized by the Biologically Active Chemical Compounds Section, Eastern Utilization Research Branch, ARS, USDA. Twenty-five plants per treatment were dipped in 25 percent ethanol solutions containing 100 ppm of acid equivalent and the excess solution was allowed to drain off. Percent of dead plants forty days after treatment were as follows: nopyl ester of 2,4,5-T, 50% and hydronopyl ester of 2,4,5-T, 46%. This compares to 33 and 21 percent kill, respectively when the propylene glycol butyl ether ester of 2,4,5-T and 2-(2,4,5-TP) were used. However, the nopyl ester of 2-(2,4,5-TP) killed only 10% of the mesquite seedlings versus 19% when 2-(2,4,5-TP) was used. Nopyl and hydronopyl esters of MCPA, 2,4-D, 2-(2,4-DP) and 4-CPA were evaluated on the basis of mesquite leaf kill one week after treatment in another test. All were less toxic than the nopyl and hydronopyl esters of 2,4,5-T which killed 88 and 91 percent of the leaves, respectively, in seven days. Leaf kill for the other compounds at the end of one week are as follows: nopyl and hydronopyl esters of MCPA, 52 and 37

percent; nopyl and hydronopyl esters of 2-(2,4-DP), 45 and 44 percent; nopyl and hydronopyl esters of 2,4-D, 16 and 19 percent; nopyl and hydronopyl esters of 4-CPA, 10 and 11 percent, respectively. The nopyl and hydronopyl esters of 2,4,5-T will be evaluated in field tests during 1957. (Contribution from Field Crops Research Branch and Eastern Utilization Research Branch, ARS, USDA in cooperation with the Texas Agricultural Experiment Station, College Station, Texas. Approved for publication by the Texas Agricultural Experiment Station and the Field Crops Research Branch and Eastern Utilization Research Branch, ARS, USDA.)

Effect of brush control herbicides on native grass production. Elder, W. C. Herbicides were applied on a mixed stand of big and little bluestem, Indian and switchgrass meadow. Urea compounds were applied when grasses were 2-4 inches high and 2,4,5-T and Ammate were sprayed on the grasses the 6th of June or near the time recommended for brush spraying on native grass ranges. All herbicides except a pellet form of CMU were applied in 40 gallons of water per acre. All plots were harvested at the proper time for best hay production.

Results:

Urea Treatments/1		2,4,5-T & Ammate Treatments	
Ck	1180 lbs. DM/A /2	Ck	1060 lbs. DM/A /3
4 lb/A Monuron (CMU)	1048	2 lb/A 2,4,5-T	1145
6 lb/A Monuron	1079	4 lb/A "	1075
8 lb/A Monuron	838	6 lb/A "	1216
8 lb/A Monuron pellets	707	50 lb/A Ammate X	809
8 lb/A Fenuron pellets	985	100 lb/A "	686

/1 Active ingredient /2 Average of 3 Rep. /3 Average of 4 Rep.

All rates of Monuron affected the grasses to some extent. It appeared that the heavier rates killed some of the small or young grasses. The pellets were applied uniformly over the plots but injury appeared in spots and not uniformly as in the sprayed plots. Fenuron was more active than Monuron soon after treatment but grasses recovered and made greater yields in the Fenuron treatments. Since the rainfall was very low for this growing season more information must be secured from these plots during the 1957 season. The 2,4,5-T treatments did not appear to injure the native grasses at any rate. All weeds were destroyed by 2,4,5-T which may account for the increased yields of hay over check plots. Ammate burned the grasses severely soon after treatment and much of the yield is from growth before treatment. Readings must be made next season to determine the effect on grass stands. (Contribution of the Agronomy Department, Oklahoma Agricultural Experiment Station, Stillwater, Okla.)

2-3-6 Trichloro benzoic acid as a foliage spray for the control of mesquite and sand shinnery oak. Fisher, C. E., Meadors, Cecil H., Behrens, Richard, and Robison, E. D. Aerial applications of 1/4, 1/2, 1 and 2 pounds acid per acre of 2,3,6-TBA in 1954 and 1955 on mesquite gave approximately the same percentage root kill as comparable amounts of 2,4,5-T acid formulated as low volatile ester. Percentage top kills obtained with TBA have been somewhat lower and regrowth appears to be more vigorous than on plots treated with 2,4,5-T. Oil soluble formulations of TBA appeared more effective than sodium salt formulations.

Aerial applications of 1/2 and 1 pound acid per acre of TBA on sand shinnery oak appeared to be less effective than comparable amounts of 2,4,5-T in studies conducted in 1956. (Contribution of the Texas Agricultural Experiment Station, Spur, Texas and the Bureau of Plant Industry, Beltsville, Maryland. Approved as technical article by Director, Texas Agricultural Experiment Station.)

Influence of aerial swath width on control of mesquite with 2,4,5-T. Fisher, C. E., Meadors, Cecil H., Behrens, Richard. In 1954 a series of tests were undertaken at 4 locations in Texas to determine the effect of various swath widths, amounts of herbicide, and volume of carrier per acre in the control of mesquite by aerial application. A low volatile ester of 2,4,5-T was applied at rates of 1/4, 1/2 and 1 pound acid equivalent per acre in a 25 percent oil-water emulsion in swath widths of 30, 42, 54, 67 and 87 feet. The volume of carrier ranged from 2.0 to 5.6 gallons per acre. An evaluation of the results obtained in these experiments in 1956 shows no significant difference in percentage root kill of mesquite due to the rate of 2,4,5-T applied or swath width used. There were differences, however, in root kills between the 4 locations due to variations in stage of growth, plant condition, and climatic factors. Results from this test indicate that 1/3 pound acid equivalent of a low volatile ester of 2,4,5-T should be applied in an oil-water emulsion containing 1/2 gallon diesel fuel and 2-1/2 gallons of water per acre in swath widths of 60 feet. (Contribution of the Texas Agricultural Experiment Station, Spur, Texas and Bureau of Plant Industry, Beltsville, Maryland. Approved as technical article by Director, Texas Agricultural Experiment Station.)

Comparative effect of substituted ureas when applied as water suspensions and pellet forms for the control of mesquite. Meadors, Cecil H., Fisher, C. E., and Behrens, Richard. Basal applications of 1/16, 1/8, 1/4 and 1 pound Monuron, Fenuron and Diuron at a rate of 1 gallon to 15 trees show that highly effective kills were obtained with 1/8 pound Monuron per gallon 3 years after treatment. Applications of Fenuron appear to give somewhat quicker kills in more recent work. Diuron did not appear to be effective 2 years after application. Applications of Monuron and Fenuron in pellet forms containing 25 percent active ingredient to basal areas of individual plants gave kills of 90 percent 2 years after treatment at rates as low as 4 grams active material per tree.

Aerial application of substituted ureas in water suspensions and in pellet forms at rates of 1.5, 3 and 5 pounds active material in 4 gallons of water per acre at two locations indicate that Monuron and Fenuron water suspensions were generally ineffective. On the other hand, applications of pellets approximately 1/16 inch in diameter and containing 25 percent active ingredient of Monuron and Fenuron markedly affected the growth of foliage the first year following application and at one location resulted in top kills and apparent root kill during the second year after treatment. No noticeable effect was observed during the second year on mesquite at the other location.

Band or strip application of Monuron and Fenuron were applied at intervals of 5, 10, 15 and 30 feet using rates of 4.5, 2.25, 1.68 and .84 pounds active ingredient per acre, respectively. The 4.5 pound rate affected plants growing near the bands, however, only a few plants appear to have been killed the second year after treatment. (Contribution of the Texas Agricultural Experiment Station, Spur, Texas and the Bureau of Plant Industry, Beltsville, Maryland.) Approved as technical article by Director, Texas Agricultural Experiment Station.

Control of salt cedar with substituted ureas. Meadors, Cecil H., Fisher, C. E. Applications of Monuron and Fenuron in 12 inch strips or bands at intervals of 5, 10 and 15 feet killed only those plants closely adjoining the treated band.

Broadcast applications of 2.50, 5.00 and 10.00 pounds active ingredient of Monuron and Fenuron in 25 percent pellet forms per acre gave kills of 10, 20, and

and 40 percent, respectively. The applications of water suspension of Monuron were largely ineffective when applied at the same rate. (Contribution of the Texas Agricultural Experiment Station, Spur, Texas.) Approved as technical article by Director, Texas Agricultural Experiment Station.

Comparative effect of substituted ureas when applied as water suspensions and pellet forms for the control of sand shinnery oak. Meadors, Cecil H., Fisher, C. E., Behrens, Richard. Aerial applications of Monuron and Fenuron in water suspensions at rates of 1.5, 3 and 5.0 pounds active ingredient in a volume of 4 gallons per acre did not appreciably influence the growth of sand shinnery oak the second year after application. Similar rates of Monuron and Fenuron in 25 percent pellets gave highly effective kills at rates in excess of 3 pounds active ingredient per acre.

Band or strip treatments approximately 12 inches wide and spaced at intervals of 5, 10, 15 and 50 feet apart show that Monuron and Fenuron gave good control of sand shinnery oak at rates of 4 pounds of active ingredient per acre in bands spaced 10 feet apart. Fenuron appeared somewhat more effective than Monuron from the standpoint of the number of plants that were killed to ground level. All grass plants in the treated band were killed. (Contribution of the Texas Agricultural Experiment Station, Spur, Texas and Bureau of Plant Industry, Beltsville, Maryland.) Approved as technical article by Director, Texas Agricultural Experiment Station.

Results with several brush herbicides on mixed hardwood trees and brush in southeastern Nebraska pastures. Shafer, N. E. All chemicals were applied by aircraft using 5 gallons total solution per acre. No. 2 diesel fuel was used as the diluent in all cases. Rainfall was below normal during the three growing seasons included in the experimental period. Treatments and results were as follows:

		Percentage kill August 22, 1956					
Initial treat. June 23, 1954	Retreatment June 15, 1955	Oaks, bur red&white	Elm	Ash	Hackberry	Dogwood	Honey Locust
1# 2,4,5-TP 1/	same	90	0	0	25	0	25
2# 2,4,5-TP 1/	same	92	25	25	75	90	25
1# D + 1# T 2/	same	50	50	50	98	95	85
2# D + 1# T 2/	same + 1# TP	93	50	50	100	100	95
2# D + 2# T 2/	same	95	50	95	100	100	95
2# 2,4,5-T 3/	1# TBA + 1# TP + 1# T	50	0	0	25	50	70

1/ PGBE and Iso-octyl formulation.
2/ Ethyl hexyl formulation.
3/ Ethoxy propanol formulation.

None of the chemicals or combinations of chemicals were effective in killing greenbrier, (Smilax sp.). Hawthorne and osage orange were eliminated wherever at least one pound of 2,4,5-T was used. Neither 2,4,5-TP nor 2,4,5-T looked as effective when used alone as when the same amount was used in combination with 2,4-D. (Contribution Department of Agronomy, University of Nebraska, Lincoln, Nebraska.) Approval for publication is not required.

Comparative effectiveness of several brush herbicides for control of dogwood, (Cornus drummondi) and (Cornus stolonifera). Shafer, N. E. All treatments were applied by aircraft at a uniform volume of 5 gallons total solution per acre. Unless otherwise noted, No. 2 diesel fuel was used as the carrier for all treatments. All plots received the same treatment for two consecutive years unless the first year's results indicated very poor control or regrowth the second year was too light to warrant treatment that year.

Results

Treatments	Type formulation	Years treated	Percentage (1956) Top kill	Percentage (1956) Regrowth
2# D + 2# T	Iso-octyl ester	1953-1955	100	5
2# D + 2# T	Butoxy ethanol ester	1953-1955	98	10
2# D + 2# T	Ethyl hexyl ester	1953-1955	98	15
3/4# D + 3/4# T	Iso-octyl ester	1953	75	98
3/4# D + 3/4# T + 1 gal.	(3.5# N) liquid nitrogen in water	1953	60	100
2# D + 2# T	Iso-octyl ester	1955	100	8
2# TBA + 2# T	Oil soluble + Butoxy ethanol	1955	30	100
3# TBA + 1# T	" " + "	1955	10	100
4# 2,4-D	Butyl ester	1954	90	90
1# D + 1# T	Iso-octyl ester	1954	50	90
2# D + 2# T	Iso-octyl ester	1954	95	40
1# 2,4,5-TP	PGBE ester	1954	0	100
1/2# 2,4,5-TP	PGBE ester	1954	0	100
2# 2,4,5-TP	PGBE ester or iso-octyl	1954-1955	95	10

(Contribution of Department of Agronomy, University of Nebraska, Lincoln, Nebraska.) Approval for publication is not required.

Brush on Right-of-Ways

R. H. Beatty

Summary

In the two abstracts received for this section the effectiveness of 2,3,6-trichlorobenzoic acid was tested at rates of 2 and 4 lb/A.

By the fall of 1956, June 1955 foliage application in water had killed white poplar, ash, hawthorne, willows and wild rose, and oak was dying slowly. Top growth of all these (except poplar and oak which showed marked effects) was dying from October 1955 dormant overall application in oil.

There was regrowth of hazel after both types of treatment, and dogwood showed only slight effects.

It may be two or three years before final results can be determined on these plots.

Abstracts

2,3,6-Trichlorobenzoic acid as a foliage spray. Playfair, Lloyd. Applied in June 1955 at rates of 2 lb/A in 15 imperial gallons of water and 4 lb/A in 30 imperial gallons of water on mixed species of woody growth. Examined for regrowth and final results in fall of 1956. White poplar, ash, hawthorne, willows and wild rose are dead. Burr oak developed some leaves but these are deformed and oak is dying slowly. Hazel shows considerable regrowth from roots. Dogwood shows only slight effect at tips of branches and appears to have survived the treatment. (Contribution of The Manitoba Power Commission, Winnipeg, Manitoba).

2,3,6-Trichlorobenzoic acid as a dormant overall spray. Playfair, Lloyd. Applied in October 1955 at rates of 2 lb/A and 4 lb/A in 15 imperial gallons of deisel fuel oil. Application made with an air blast machine to ½ acre plots near Winnipeg. Burr oak, white poplar, ash, hawthorne, willows, wild rose, hazel and dogwood were present. Examined in early fall of 1956 top growth appeared to be dying, except on dogwood which showed only slight effect at tips of branches. There was regrowth from root of hazel. Oak and poplar had leafed out but were showing marked effect of spray. This chemical appears to act more slowly than 2,4-D or 2,4,5-T. (Contribution of The Manitoba Power Commission, Winnipeg, Manitoba).

Permission to publish not required

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CONTROL OF BRUSH IN FORESTS, TREE PLANTATIONS AND FARM WOODLANDS

Summary

Henry L. Hansen

Abstracts received for 1956 indicate a variety of problem interest. Tests in Michigan involving five methods of killing undesirable trees indicate that considering labor cost only, the methods varied from least to most costly in the following order: girdling by portable machine, basal spraying, sodium arsenite in holes made by a Cornell tool, basal spraying in axe-cut frills, and insertion of sodium arsenite tabs under the bark with a special tool. This rating has no bearing on the relative effectiveness of these treatments.

Various herbicidal treatments have been tested in Wisconsin to obtain root-kill of oaks and to prevent the spread through root grafts of the oak wilt fungus. Effective "barriers" were obtained using sodium arsenite injections into the root collars; soil applications of 100 and 200 lb. per acre of 3-(p-chlorophenyl)-1, 1-dimethylurea in water suspensions; and soil fumigation using methyl bromide. Frequent escapes of the fungus resulted from the use of 2,4-D; 2,4,5-T; mixtures of 2,4-D and 2,4,5-T; or ammonium sulfamate.

Extensive tests have been made on light soils in Wisconsin for the control of grass and weeds in forest firelanes. Under these conditions excellent weed control has been obtained for as long as 5 years using 3-(p-chlorophenyl)-1, 1-dimethylurea and 3-(3,4 dichlorophenyl)-1, 1-dimethylurea. In pulpwood storage yards where decayed wood waste has accumulated, weed control beyond 1 or 2 years was difficult to obtain in tests involving many different herbicides.

Control of green alder (Alnus crispa) was reported to be 88 per cent or better using 4:2 mixtures of butoxyethanol esters of 2,4-D and 2,4,5-T at 2 lb. AHG or more applied in diesel oil as a basal spray at bud-burst time in Minnesota.

Abstracts

A comparison of several methods of killing undesirable trees. Day, Maurice W. Five methods were tested on 200 trees to determine the comparative labor costs. The methods used were: (1) portable power girdling machine (2) basal spray applied with knapsack sprayer (3) sodium arsenite solution placed in holes made with a Cornell tool (4) frill girdles made with an axe and filled with basal spray solution (5) sodium arsenite tabs placed under the bark with a special tool. In terms of man hours used, the methods ranked in the order given with the power girdler taking the least time and the tab method the most. Each method has certain advantages and disadvantages. The power girdler requires a larger investment and is not suitable for use on multiple stems. Basal spray requires high material and transportation costs for the large volume used. Sodium arsenite used with the Cornell tool creates a poisoning hazard. Frill girdling requires a much smaller volume of spray and is more effective on larger trees. The tab method is simple, requires a minimum of tools and materials and works especially well on smaller thin barked trees, but it can be used only during the growing season. (Contribution of Michigan Agricultural Experiment Station, East Lansing, Michigan)

Chemical control of the oak wilt disease. Drake, C. R., J. E. Kuntz, and A. J. Riker. The oak wilt fungus, Endoconidiophora fagacearum Bretz, moves through naturally grafted roots from an infected oak to adjacent healthy oaks, usually within a radius of 50 ft. and especially in dense stands. The severing of all root connections, either mechanically or chemically, has suppressed or prevented further local spread. Since the fungus moved from infected trees soon after initial foliage wilt symptoms appeared, treatments were applied promptly. "Barriers" of trees poisoned by sodium arsenite injection into the root collars prevented such

spread. Root kill was essential. The effectiveness of other, less toxic herbicides in eradicating northern pin oaks (Quercus ellipsoidalis Hill), 4 to 12 in d.b.h., was tested (see NCWCC Res. Rpts. 1950-54). While generally accepted treatments using 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), mixtures of these, and ammonium sulfamate (ammate) gave good to variable top kill, direct root kill was limited. Variable sprouting from surviving roots and root collars followed. In many cases, the fungus "escaped" across the barrier of poisoned trees and continued to spread beyond. 3-(p-chlorophenyl)-1, 1-dimethylurea (Monuron), at 100 and 200 lb/A in a water suspension, was applied to a 3 ft. wide band of soil 10 ft. from the infected trees. Oaks within 30 to 40 ft. of the treated band were killed or severely injured. Effects, however, were slow to appear with limited refoliation and trunk suckering sometimes continuing the second and third years. The fungus rarely escaped such barriers. Soil injections of methyl bromide (CH_3Br) also proved effective in killing oak roots and in preventing fungus spread. The fumigant was applied either under an air-tight, polyethylene "tent" or by means of a modified MacLean Rodent Dispenser to a depth of 23 to 30 in. Trees near the fumigated strip often were injured. No escapes followed treatments at the incipient wilt stage. (Contribution of the Wisconsin Agricultural Experiment Station in cooperation with the Wisconsin Conservation Department and the Nekoosa-Edwards Company)

Reducing fire hazards from grass and weeds in forest firelanes and in pulpwood storage yards. Kuntz, J. E., Les Wellman, and A. J. Riker. The vigorous growth of grass and weeds in forest firelanes and in pulpwood storage yards constitutes a serious fire hazard. Weed control by mechanical means, such as mowing, disking, or rototilling, has critical limitations, and these procedures often aggravate the problem. Since 1950, many herbicides have been tested on the sandy soil of Central Wisconsin where midsummer rainfall becomes limiting (see NCWCC Res. Rpts. 1950 to 1954). In the firelanes, with little accumulated humus, 3-(p-chlorophenyl)-1, 1-dimethylurea (Monuron) and 3-(3,4-dichlorophenyl)-1, 1-dimethylurea (Diuron) applied in the spring at 20 lb/A have given excellent weed control for as long as 5 years. A few, weakened, deep-rooted perennials persisted. 2-(2,4,5-trichlorophenoxy)ethyl 2,2-dichloropropionate (Erbon) at 80 and 160 lb/A gave excellent, first season, weed control and in most plots, very little or no regrowth of weeds the second year. Erbon at 40 lb/A gave satisfactory weed control the first year. July applications of 2,2-dichloropropionic acid (Dalapon) at 10 and 20 lb/A in combinations with 2,4-dichlorophenoxyacetic acid (2,4-D) at 2 and 4 lb/A gave excellent initial control of grass and weeds but permitted variable regrowth the second year. Sodium trichloroacetate (TCA) at 25 and 50 lb/A in combinations with 2,4-D at 2 and 4 lb/A gave good to variable weed control the first season but permitted sparse to abundant regrowth the second year. Small plots, hand-treated with borascu at 10 and 20 lb/sq rd remained free of most weeds for about 2 years. In pulpwood storage yards where considerable decayed wood waste had accumulated, Monuron, Diuron, and Fenuron at 20 lb/A failed to control weeds even the first season. These materials at 30 lb/A controlled most grass and annual weeds but allowed, for example, ferns, horsetail, grape, Virginia creeper, milkweed, flowering spurge, dogbane, prickly lettuce, dandelion, ground cherry, and toadflax to persist. Results were variable; some areas remained bare for one season; others showed rapid recovery especially when low-lying and moist. Monuron at 45 and 60 lb/A gave good results the first and usually the second seasons, except for certain deep-rooted perennials, but permitted considerable regrowth by the third season. Weed populations changed. Only small, sparse horsetail remained in plots treated 4 years before with Monuron at 80 lb/A. In contrast, Diuron at 45 and 60 lb/A gave good initial control with little regrowth after 3 years. Erbon at 80 and 160 lb/A gave excellent weed control the first season, with little or no regrowth the second season at the higher rate. Midseason applications of Dalapon at 20 lb/A in combination with 2,4-D gave excellent initial control of grass and weeds,

but permitted abundant regrowth the second year. (Contribution of the Wisconsin Agricultural Experiment Station in cooperation with the Wisconsin Conservation Department and the Nekoosa-Edwards Paper Company)

Basal spraying gives good control of green alder clumps. Roe, Eugene I., and Lindholm, Vernon V. In late May 1955, clumps of green or upland alder (*Alnus crispa*) interfering with the development of a jack pine plantation near Isabella, Minnesota, were basal sprayed with a mixture of 2,4-D and 2,4,5-T in diesel oil just as the buds were bursting. The concentrations used were 0, 1/4, 1/2, 3/4, 1, 2, and 3 per cent by volume of a mixture of the butoxyethanol esters of D and T, containing 1-1/3 lb. D and 2/3 lb. T per gal. AHG was, therefore, 0 to 6.0 lbs. Twenty-five clumps of the alder, 3 to 6 feet high and averaging 26 stems each, were sprayed with each concentration. The solutions were applied from the ground line to a height of 1 foot. In August 1956, at the end of the second growing season, the individual stems were tallied for survival and the clumps rated as to vigor. The results follow:

Concentration			Dead stems	Clumps dead or of poor vigor
By vol.	AHG: D & T	AHG: T		
Pct.	Lbs.	Lbs.	Percent	Percent
0	0.0	0.00	4	0
1/4	0.5	0.17	24	12
1/2	1.0	0.33	69	72
3/4	1.5	0.50	69	64
1	2.0	0.67	82	88
2	4.0	1.33	90	100
3	6.0	2.00	98	100

Judging from this study, satisfactory control of this troublesome alder (80 to 90 per cent of the stems killed) can be obtained from basal sprays containing about 2 lbs. AHG of the mixture, including 2/3 lb. 2,4,5-T. Solutions stronger than this will eliminate the brush but add unnecessarily to the cost. (Lake States Forest Experiment Station, Grand Rapids, Minnesota, and Superior National Forest, Duluth, Minnesota)

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Chemical Drying and Pre-Harvest Weed Control

N. E. Shafer

Summary

Three abstracts were received reporting results on flax, alfalfa, red and alsike clover, and potato vines. Sodium pentaborate-sodium chlorate at 5, 10, and 20 lb per acre applied 2 days and 14 days prior to physiologic maturity of flax had no significant effect on seed moisture. Three other defoliants were likewise ineffective.

DNBP at 1 1/4 and 2 1/8 lb per acre was most effective on alfalfa, red clover, and alsike clover. Moisture content of the seed was less than windrowed plots and seed yields were greater. Endothal, PCP, and SD 1369 dried all foliage but did not desiccate weed species thoroughly. Magnesium chlorate was only partially effective on alsike clover. Seed viability was not reduced by any desiccants used.

Potato vines were effectively dried using either a 1:4 dilution of a 40% sodium arsenite in water applied by aircraft or a 1:149 dilution applied by ground sprayer. Retreatment on airplane sprayed plots did not improve results. Ground spraying was somewhat less effective due to streaked application and poorer vine kills in wheel paths.

Abstracts

The effect of defoliants on flax, 1956. Selleck, G. W. and R. T. Coupland. Sodium pentaborate (58%) - sodium chlorate (40%) at 5, 10 and 20 lb per acre and three defoliants from Chemagro corporation (chemical nature of the formulations not released to authors) at 2, 4 and 8 lb per acre were applied to weed-free flax plots in triplicate, Sept. 14 and Sept. 26. The latter date was considered to be approximately 2 days prior to the stage when the flax seed was mature enough to harvest. Five days after each treatment, samples (as represented after cutting) were tested for moisture content. No effects were apparent as a result of the early treatment. There was a tendency for moisture content to decrease with an increase in the rate of doseage after the second treatment, but these differences were not statistically significant. The check plots of the flax samples which were taken at the first date contained an average of 38.7% more moisture than those which were taken 12 days later. Yield tests did not reveal any significant effects as a result of application of defoliants. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., with financial assistance from the Sask. Agricultural Research Foundation.)

Potato vine killing with high volume ground equipment vs. low volume airplane equipment. Shafer, N. E. A standard dosage of one gallon per acre of a 40% sodium arsenite formulation in water was used in all treatments. Pontiac, a late maturing variety with heavy foliage, was treated August 8 with two blocks sprayed at 5 gallons per acre, two blocks sprayed at 10 gallons per acre and one block sprayed at 150 gallons per acre. All except the latter treatment were applied by aircraft. On August 10, one of each of the pairs of airplane sprayed blocks was retreated at 1/2 the original chemical dosage in the same volume of water as the initial treatment. There was no retreatment on the 150 gallon per acre plot.

Results on August 13 were as follows: the single treatment at 5 gallons per acre had killed 95 to 99% of the foliage and stems and looked equally as effective as the 10 gallon per acre treatment; retreatment after two days did not improve results at either 5 gallons or 10 gallons per acre; the 150 gallon treatment had killed

approximately 90% of the leaves and 70% of the stems, showed a more streaked application and resulted in poorer kills of vines in the sprayer and tractor wheel paths. No differences in skinning, tuber color, or stem end discoloration were observed. (Contribution, Department of Agronomy, University of Nebraska, Lincoln, Nebraska.)

Spray-curing legumes grown for seed. Yeo, R. R. and Dunham, R. S. Alfalfa and red and alsike clovers were sprayed with the following desiccants and rates in lb per acre: endothal, .63 and 1.26; PCP, 1/4 and 1/2; SD 1369, 2 and 4; and DNBP, 1 1/4 and 2 1/8. Magnesium chlorate at 2 1/2 and 5 lb per acre was also sprayed on alsike clover. All desiccants were applied at a volume of 15 gallons per acre in diesel oil, except magnesium chlorate and endothal which were applied in water. The weeds present were perennial sow and Canada thistles. Results: DNBP dried all the foliage and reduced the moisture content of the seed to less than windrowed plots; seed yields were greater than windrowed plots. Both thistles were completely desiccated. Endothal, PCP and SD 1369 also dried all the foliage, but failed to desiccate the thistles completely. Magnesium chlorate only partially cured the alsike clover. Regrowth appeared in four days on all treated plots, except the DNBP plots, where it was delayed until seven days on alsike clover, ten days on alfalfa and sixteen days on red clover. Viability of the seed of the legumes was not reduced by any desiccant. (Contribution by the Department of Agronomy and Plant Genetics, University of Minnesota, Paper No. 3663 Sci. Jour. Series, Minn. Agric. Exp. Sta.)

NEW HERBICIDES

W. C. Dutton

SUMMARY

Contributors to the 1956 N.C.W.C.C. Research report were instructed in the communication of August 31, 1956 from the Chairman and the Vice-Chairman of the Research Committee to submit for use in preparing this summary abstracts on all compounds that are not included in the list of chemicals on Pages 280 and 281 of Weeds, Vol. IV., No. 3, July, 1956. This rule includes the phenoxybutyric group of compounds and others included in the list in Weeds. In addition, results on a few relatively old, unlisted compounds that have been reported in previous years were not included in this summary. A number of abstracts were not used because of the compounds listed not qualifying as "new herbicides" under the rule indicated this year.

This summary is based on 11 abstracts and 5 compounds. The results presented in these abstracts are here indicated without any interpretation. Full information can be obtained by reference to the abstracts under the weed or crop concerned.

Sodium arsonoacetate
Sodium arsonoacetate (1 report) in repeated applications at 1 oz. per 1000 sq. ft. in mid- and late summer gave from unsatisfactory to poor control of crabgrass in bluegrass sod.

3,5-Dimethyltetrahydro-1,3-5,2H-thiadiazine-2-thione
(Mylone)(1 report) was used at 200 and 300 lbs./A on seeded kale, spinach, and turnips, as preplant treatments and roto-tilled to depth of 4 inches. Kale and spinach were severely injured or inhibited and weed control was less than 60%. The yield of turnips was significantly greater than on checks (about 28%), apparently due to stimulation of turnip growth and crowding out weeds.

2-chloro-4,6-bis(ethylamino)-s-triazine
(Simazin) (2 reports) was used pre-emergence at 2 and 4 lbs. on corn and soybeans. Weed control was good at 4 lbs. in both crops and 4 lbs. was safe on corn; but both 2 and 4 lbs. caused severe injury to soybeans.

(1-chloropropyl-2) N-(3-chlorophenyl) carbamate
(CPCPC) (2 reports) used at 4 and 8 lbs. in pre-seeding applications for wild oats in silty clay soil on which 13 crops were seeded. Oats control was 20% and 40% for the two rates. Crop growth was too poor to permit reliable observations. The same rates were used for green foxtail and gave zero control.

Tris-(2,4-dichlorophenoxyethyl) phosphite
(EH-3Y9) used pre-emergence in peas at 4 and 6 lbs. gave slight control of *Setaria* sp. at 4 lbs. and fair at 6 lbs. and crop injury was slight at 6 lbs.; four lbs. in combination with 4 lbs. CDT used pre-emergence on onions gave 51% weed control and had slight effect on the crops; an emergence application of 8 lbs. on potatoes in muck gave 44% weed control and had no effect on yield and combinations

with CIPC and CDT gave 70% and 80% weed control with no yield reductions; pre-emergence application in corn at 2 and 4 lbs. was unsatisfactory; in another study, 2 and 4 lbs. pre-emergence in corn gave 27% and 43% weed control but Yield records could not be taken because ofdrought and in milo 2 and 4 lbs. pre-emergence gave zero and 72% weed control and reduced stand and stunted the sorghum.

Mechanical Considerations

R. E. Larson

Summary

Spraying Equipment. In studies to determine if residual toxicity exists in porous clay pots when treated with 2,4-D and 2,4,5-T, Switzer has found that the residues of the two herbicides break down rather rapidly in pots containing soil. Although the 2,4,5-T indicated less toxicity early in the experiment, it did tend to stay in an active form longer than the 2,4-D.

Weed Control Methods and Equipment in Crops. In studies to determine the relative effectiveness of various combinations of pre-emergence sprays, rotary hoeing, and cultivation in soybeans, Larson, Klingman, and Kerr found that wet and dry conditions for rotary hoeing did not show significant differences. Timely rotary hoeing was very important and the use of PCP(Na) 20 lb./A pre-emergence improved yields for all treatments such that they were equal to hand weeding. In studies of a similar nature at Minnesota, Liljedahl and Strait report that two timely rotary hoe treatments tended to improve the yield of soybeans and reduce the weed stand. In two years' studies of band spraying Liljedahl and Strait report that as the band width is increased from 5 in. to 20 in. it tends to increase soybean yields and reduce weed populations. In a study of the effect of depth of rotary hoe tooth penetration, they report that penetration to 2.875 in. tended to be more effective than shallower operations. Liljedahl and Strait also report that in studies of the effect of the speed of operation of the rotary hoe they found no significant differences in a range of speeds from 1.5 to 9 mph. Visual observations at the time of application led them to believe the speed of 1.5 mph would not be as effective on the weeds as the faster speeds and the speed of 9 mph was covering more soybean plants than the slower speeds. In studies of the effect of repeated rotary hoeing on corn and soybeans conducted in 1954, they find that up to five rotary hoeings at one-week intervals tended to damage the beans and decrease the yields. On the other hand, in 1955 similar numbers of rotary hoeings at three-day intervals tended to increase the yields slightly through better early weed control. In an abstract included in the soybean section, Larson, Klingman, and Kerr report that 12 in. band applications of CDAA plus 3 cultivations and similar band applications of PCP(Na) plus 2 or 3 cultivations resulted in yields equal to or better than unsprayed checks cultivated 3 times. Liljedahl and Strait report a study of various substitutes for the first cultivation in corn production to indicate that DNBP 4.5 lb./A was a satisfactory substitute in 1954 and 1955 as were 1.5 lb. 2,4-D (butyl ester) and spike tooth harrow plus rotary hoe in 1955.

In an abstract included in the annual grass weeds section, Wilson and Friesen report that the application of IPC in an anhydrous ammonia solution reduces the effectiveness of the IPC for controlling wild oats. In another abstract in the sugar beet section, Schreiber reports that IPC roto tilled into the soil in a band over the row resulted in good control of wild oats. There was an indication of a need for exact depth control in such applications to provide the necessary position differential between the beet seed and the herbicide.

In studies of post-emergence application equipment, Larson reports no effective differences due to method of application when using boom, drop pipe or shield mountings in applying herbicides to soybeans. In a study of the use of shields as a method for reducing dalapon injury to corn, Larson and Fletchall find the use of drop pipes and shields tend to reduce corn injury by decreasing the amount of dalapon applied directly to the corn.

Brush Control Equipment. In a study of equipment factors in hand sprayer basal applications, Larson reports that stem size, bark condition, nozzle type and extension length are factors tending to cause variations in the amount of material applied.

Abstracts

Studies on the residual effects of 2,4-D and 2,4,5-T in porous clay pots. Switzer, C. M. New 3 inch porous clay pots were soaked for 5 minutes in aqueous solutions of the following chemicals: 2,4-D amine, 500 and 1000 ppm; 2,4-D ester, 500 and 1000 ppm; and 2,4,5-T, 500 and 1000 ppm. After drying in the sun for one hour, the pots (10 per treatment) were filled with potting soil (4:1:1 mixture of clay-loam, peat and sand) and 2 red kidney bean seeds were planted in each. These pots were left in a sheltered location outside.

Four weeks later the plants in 5 of the pots treated with 2,4-D amine 1000 ppm. were dead, and the rest were badly twisted and distorted. Treatment with 2,4-D amine 500 ppm. and 2,4-D ester 1000 ppm. also brought about marked formative effects. The plants in pots to which 2,4,5-T had been applied were affected considerably less. With the exception of 2,4-D amine 1000 ppm. none of the treatments reduced plant size appreciably. In another experiment autoclaving of the pots had little effect, except in those pots treated with 2,4-D amine 1000 ppm. where the plants were less severely affected than in the pots not autoclaved.

After harvesting, the soil was replaced with fresh mixture and tomato seedlings were planted. These plants were harvested and weighed after four weeks (8 weeks after pots treated). None of the treatments reduced the size of the tomatoes, but considerable swelling and proliferation of the lower part of the stem was noted in 9 pots treated with 2,4,5-T 1000 ppm. Plants in 4 pots treated with 2,4,5-T 500 ppm. and in 5 pots treated with 2,4-D amine 1000 ppm. showed slight swelling of the lower stems. All other plants appeared normal.

The soil in the pots was again replaced after harvest and another crop of tomato seedlings was planted. When harvested 4 weeks later (12 weeks after pots treated) the plants in 3 pots treated with 2,4,5-T 1000 ppm. showed some swelling and proliferation of the lower stem. All other plants were normal.

These results indicate that herbicides of the 2,4-D and 2,4,5-T type break down relatively rapidly in pots containing soil. Although the least toxic early in the experiment, 2,4,5-T was apparently retained in an active form longer than any of the others. Since the quantity of herbicide applied to these pots was much higher than would occur under normal conditions of contamination, there would seem to be little danger of long-term contamination of pots in which plants have been sprayed with 2,4-D. (Contributed by the Dept. of Botany, Ontario Agricultural College, Guelph, Ontario.)

Study of rotary hoeing, cultivation, and chemical combinations for weed control in rowed soybeans. Larson, R. E., Klingman, D. L., and Kerr, H. D. Clark soybeans planted in rows were given mechanical treatments which included 2 cultivations, 3 cult., 4 cult. (2 with rotary hoe attachment over row), 2 RH (timely) + 2 cult., 1 RH (late) + 2 cult., 1 RH (wet) + 2 cult., 2 RH (wet timely) + 2 cult., and 3 or 4 RH (until beans were 8 in. tall) + 1 cult. Timely RH treatments were applied between time when weeds were emerging to very young seedling stage. Late RH treatment delayed the rotary hoeing approximately one week until weeds were in 2- to 3-leaf stage. Rotary hoeings were made at about 5-7 day intervals. Wet RH treatments were applied soon after rains when the soil was still wet. The RH

attachment for the cultivator had 3 RH wheels operating in an 8 in. band over the row. All cultivation was done with sweep type shovels. Sub-treatments included PCP(Na) 20 lb./A pre-emergence, hand weeding, and no additional weeding.

Analyses of the yield results showed one late rotary hoeing to be significantly less effective than two timely rotary hoeings. Wet and dry conditions for rotary hoeing did not show significant differences. Four RH ≁ 1 cult. with no sub-treatment resulted in the lowest yield and poorest weed control of all treatments. With no sub-treatment 2 cult. yielded 3.9 bu/A less than 3 cult., and 6.5 bu/A less than 4 cult. (2 with RH attachment) which yielded 30.8 bu/A. With no sub-treatment, mechanical treatments of 2 cult., 1 RH (wet) ≁ 2 cult., 1 RH (late) ≁ 2 cult., and 4 RH ≁ 1 cult., gave yields which were significantly lower than those for the other four treatments. The use of PCP(Na) 20 lb/A pre-emergence or hand weeding eliminated all significant differences for all mechanical treatments. The average of all plots treated with PCP(Na) 20lb/A was 29.78 bu/A as compared to 30.24 bu/A for hand weeded plots. (Contribution of the Farm Machinery Section, A.E.R.B., and Weed Investigations Section, F.C.R.B., A.R.S., U. S. Department of Agriculture, Columbia, Missouri.)

<u>Comparison of some substitutes for the first cultivation in soybeans.</u> Liljedahl, L. A., and Strait, J. In 1955, 1/30 acre plots of soybeans were given various treatments that might be substitutes for the first cultivation. These treatments were followed by two later cultivations with conventional cultivating equipment. All plots were damaged somewhat by TCA residue in the soil. Weed growth ratings, and yields, were as follows:

Treatment	Yield, bu/A	Weed Growth 0-10
Check - conventional cultivation	22.0	3.3
Rotary hoed at first true leaf stage and again one week later	23.7	2.7
Rotary hoed at first true leaf stage	23.8	4.0
8 lb/A DNBP pre-emergence spray	24.7	0.3
8 lb/A CIPC pre-emergence spray	16.9	4.5

Because of TCA damage to the crop, all plots were quite weedy except those receiving the DNBP treatment, which gave excellent weed control. The differences in yields were not significant.

In 1956, plots of soybeans were again given similar treatments that might be substituted for the first cultivation, and followed by two later conventional cultivations. Weed population, based on counts of six random square yards 15 days after layby, and yields were as follows:

Treatment	Yield, bu/A	Weed Pop./A
Check - conventional cultivation	24.7	147,000
Rotary hoed as first weeds emerged	24.8	114,000
Rotary hoed as first weeds emerged and again one week later	25.8	121,000
8 lb/A DNBP pre-emergence spray	24.8	150,000
4 lb/A Alanap pre-emergence spray	24.1	152,000
4 lb/A CDAA pre-emergence spray	25.5	167,000

Differences in yield and weed populations were not significant at the 5% level; at the 10% level, the yield of plots rotary hoed twice was barely significantly better than the rest. (Contributed by Agricultural Engineering Research Branch, A.R.S., U.S.D.A., and Agricultural Engineering Dept., Minnesota Agricultural Experiment Station.) (Paper No. 3685, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Effect of band width on effectiveness of over-the-row band application of herbicide sprays. Liljedahl, L. A., and Strait, J. In 1955, 1/30 acre plots of corn were sprayed with $4\frac{1}{2}$ lb/A of DNBP at the coleoptile stage. The spray was applied in over-the-row bands of varying widths. All plots then received two cultivations with conventional cultivating equipment. Average yields were as follows:

Band Width	Yield, bu/A
5 in	53.9
7 in	53.6
10 in	59.8
20 in	58.3

These results showed a trend toward increased yields as the band width increased. By analysis of variance of the regression, the probability that there was no regression, that is, $r = 0$ was $P = 0.11$. The best estimate of straight line regression was: yield, $Y = 53.8 + 0.301 X$, where X = the band width in inches.

In 1956, 1/30 acre plots of soybeans were given a pre-emergence spray of 4 lb/A sodium salt N-1 napthlyl phthalmic acid (Alanap 3) in over-the-row bands of varying widths. All plots then received two cultivations with conventional cultivating equipment. Weed population, based on counts in six random square yards in each plot 15 days after layby, and yields were as follows:

Band Width	Weed Population/A	Yield, bu/A
5 in	182,000	39.0
7 in	164,000	37.5
10 in	179,000	37.6
20 in	104,000	39.1

A trend toward increased weed population with decreasing band width is evident. By analysis of variance of the regression, the probability that there was no regression, that is, $r = 0$ was $P = 0.025$. The best estimate of the straight line regression was: population, $N = 210{,}000 - 5100 X$, where X = the band width in inches. The differences in yield were not significant. (Contributed by Agricultural Engineering Research Branch, A.R.S., U.S.D.A., and Agricultural Engineering Dept., Minnesota Agricultural Experiment Station, St. Paul, Minn.) (Paper No. 3686, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Effect of tooth penetration in rotary hoe operation. Liljedahl, L. A., and Strait, J. In 1956, 1/30 acre plots of soybeans were rotary hoed once at 6 mph, with varying depths of tooth penetration. This was followed by two conventional cultivations. Weed population, based on counts of six random square yards in each plot 15 days after layby, and yields were as follows:

Treatment	Weed Population, per A	Yield, Bu/A
Rotary hoed 1 3/8 in deep	69,700	23.9
Rotary hoed 1 7/8 in deep	68,200	24.2
Rotary hoed 2 3/8 in deep	38,500	23.8

When the plots were observed approximately 14 days after the first cultivation and 40 days after the rotary hoe treatment, there appeared to be considerably fewer weeds in the plots hoed to a depth of 1 7/8 and 2 3/8 inches as compared to the plots hoed to a depth of 1 3/8 inches. Most of the weed count observations indicated definitely better control of weeds when the rotary hoe was operated with a tooth penetration of 2 3/8 inches.

Differences in yields were not significant. The weed count, while variable, when analysed for regression showed the best estimate of weed count to be $C = 117,600 - 31,200d$ where d = depth in inches in the range $1\frac{1}{2}$-$2\frac{1}{2}$ inches. By analysis of variance of the regression, the probability that there was no regression, that is, $r = 0$ was $P = 0.09$. (Contributed by Agricultural Engineering Research Branch, A.R.S., U.S.D.A., and Agricultural Engineering Dept., Minnesota Agricultural Experiment Station.) (Paper No. 3684 Scientific Journal Series, Minn. Agr. Exp. Sta.)

Effect of speed in rotary hoe operation. Liljedahl, L. A., and Strait, J. In 1955, 1/30 acre plots of soybeans were rotary hoed once at varying speeds at the first true leaf stage. Tooth penetration was 1 3/8 in. The plots were later cultivated two times with conventional cultivating equipment. Weed growth ratings 15 days after layby were as follows:

Treatment Given	Weed Growth Rating, 0-10
Rotary hoed at 2 mph	4.0
Rotary hoed at 4 mph	3.7
Rotary hoed at 6 mph	3.6
Rotary hoed at 8 mph	2.7

In 1956, 1/30 acre plots of soybeans were rotary hoed once at varying speeds as weed seedlings were just emerging, with no attention to stage of soybean growth. The plots were again cultivated later with conventional cultivation equipment. Tooth penetration was 1 7/8 in. Weed population, based on the count in 6 random square yards in each plot 15 days after layby, and yield are as follows:

Treatment Given	Weed Population, per A	Yield, Bu/A
Rotary hoed at $1\frac{1}{2}$ mph	88,400	24.4
Rotary hoed at 3 mph	70,500	24.5
Rotary hoed at 6 mph	79,500	24.4
Rotary hoed at 9 mph	93,000	24.7

The differences in weed count and yield were not significant by analysis of variance, and no trend appeared evident. At the time the beans were hoed, it appeared that the hoe operating at speeds of 3, 6, and 9 mph was somewhat more effective in uprooting weed seedlings than at $1\frac{1}{2}$ mph. At 9 mph the hoe seemed to cover and damage a few more beans than it did at slower speeds, but as indicated by the nearly equal yields in all plots, there was little damage to the beans. (Contributed by Agricultural Engineering Research Branch, A.R.S., U.S.D.A., and Agricultural Engineering Dept., Minnesota Agricultural Experiment Station.) (Paper No. 3683, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Effect of mechanical damage due to rotary hoeing on corn and soybeans. Liljedahl, L. A., and Strait, J. In 1954, 1/30 acre plots of corn and soybeans were given repeated rotary hoe treatments at different stages of growth to determine the degree of mechanical damage inflicted by the hoe as measured by crop yields. All plots received, in addition to the rotary hoe treatments, three conventional shovel cultivations, so that variable weed control would not affect yields. The yields from the corn plots are shown below:

Treatment Given	Yield, bu/A
Rotary hoed at 2-4 in height	41.5
Rotary hoed at 2-4 in height, once later one week later	39.5
Rotary hoed at 2-4 in height, twice later at week intervals	37.4
Rotary hoed at 2-4 in height, three times later at week intervals	33.9
Rotary hoed at 2-4 in height, four times later at week intervals	18.2

It is evident that the yield drops off severely at the fifth rotary hoeing, but even the first four treatments show a trend toward reduction in yield with increased rotary hoeings. The data for the first four treatments, when analysed for regression, showed the best estimate of the yield to be $Y = 44.3 - 2.5X$ where X = the number of passes in the range from 1 to 4 passes. By analysis of variance of the regression, the probability that there was no regression, that is, $r = 0$ was $P = 0.015$.

The yields of the soybean plots were as follows:

Treatment Given	Yield, bu/A
Rotary hoed at first true leaf stage	22.02
Rotary hoed at first true leaf stage, once one week later	20.40
Rotary hoed at first true leaf stage, twice later at weekly intervals	18.35
Rotary hoed at first true leaf stage, three times later at weekly intervals	20.70
Rotary hoed at first true leaf stage, four times later at weekly intervals	17.45

These yields also show a trend, though not so pronounced, toward reduction in yield with increased rotary hoeings. By regression tests, the best estimate of the yield was $y = 22.4 - 0.87X$ where X = the number of passes in the range 1 to 5 passes. By analysis of variance of the regression, the probability that there was no regression, that is, $r = 0$ was $P = 0.04$. (Contributed by Agricultural Engineering Research Branch, A.R.S., U.S.D.A., and Agricultural Engineering Dept., Minnesota Agricultural Experiment Station.) (Paper No. 3682, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Effectiveness of several rotary hoeings. Liljedahl, L. A., and Strait, J. In 1955, 1/30 acre plots of soybeans were rotary hoed at the first true leaf stage, followed by one, two or three more rotary hoeings at two or three day intervals. Tooth penetration was 1¼ in and speed of operation 5 mph. Cultivation was completed by two later cultivations with conventional equipment. Weed growth ratings 15 days after layby, and yields were as follows:

Treatment	Yield, bu/A	Weed Growth, 0-10
One rotary hoeing	24.1	3.5
Two rotary hoeings	17.3	4.0
Three rotary hoeings	24.3	4.9
Four rotary hoeings	21.6	5.0

The differences in yields were not statistically significant, but it is apparent that there was an increase in weed growth with increased number of rotary hoeings, especially with three and four rotary hoeings.

Also in 1955, 1/30 acre plots of corn were rotary hoed at the 2-4 in height, followed by one, two or three more rotary hoeings at two or three day intervals. Tooth penetration was 1¼ in and speed of operation 5 mph. Cultivation was completed by two later cultivations with conventional equipment. Plot yields were as follows:

Treatment	Yield, bu/A
One rotary hoeing	55.7
Two rotary hoeings	58.7
Three rotary hoeings	62.2
Four rotary hoeings	62.7

A trend toward increased yield with increased rotary hoeings is evident, but when analysed for regression, the probability that there was no regression, that is, $r = 0$ was $P = 0.17$. From regression analysis, the best estimate of yield in bu/A was $Y = 53.9 + 2.13 X$ where X = the number of rotary hoeings in the range of 1 to 4. (Contributed by Agricultural Engineering Research Branch, A.R.S., U.S.D.A., and Agricultural Engineering Dept., Minnesota Agricultural Experiment Station.) (Paper No. 3687, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Comparison of some substitutes for the first cultivation in corn. Liljedahl, L. A., and Strait, J. In 1954, 1/30 acre plots of corn were given various treatments that might be substituted for the first cultivation. These treatments were followed by two later cultivations with conventional cultivating equipment. Weed population, based on count in center 7 ft x 50 ft of plots 15 days after layby, and yields are as follows:

Treatment	Yield, bu/A	Weed pop./A
Check - conventional cultivation	34.5	11,900
Rotary hoed at 2-4 in height	17.9	56,500
Rotary hoed at 2-4 in height and again at 6-8 in height	17.8	42,100
Spike tooth harrowed at 2-4 in height, rotary hoed at 6-8 in height	22.9	25,700
4½ lb/A DNBP spray at 2-4 in height	37.3	2,500
1½ lb/A butylester of 2,4-D pre-emergence spray	29.1	10,600

Yield and weed control of the rotary hoed plots were significantly lower than check, and weed control with 4½ lb/A DNBP was significantly better than check. A heavy infestation of quack grass in all plots tended to mask out differences in control of other weeds as affected by the rotary hoe and spike tooth harrow treatment.

In 1955, plots of corn were again given similar treatments that might be substituted for the first cultivation, and followed by two later conventional cultivations. All plots were damaged somewhat by TCA residue in the soil. Weed growth ratings and yields were as follows:

Treatment	Yield, bu/A	Weed Growth 0-10
Check - conventional cultivation	63.6	4.5
Rotary hoed at 2 in height	59.9	3.5
Rotary hoed at 2 in height and again 3 days later	54.5	3.0
Spike tooth harrowing at 2 in height	54.5	4.3
Spike tooth harrowing at 2 in height, rotary hoed 3 days later	65.4	4.5
4½ lb/A DNBP spray at coleoptile stage	65.7	3.7
1½ lb/A butylester of 2,4-D pre-emergence spray	63.3	3.5

Rotary hoeing twice and spike tooth harrowing alone were the only treatments which were significantly worse than check. All plots were quite weedy and no treatment appeared to give significantly better weed control. (Contributed by Agricultural Engineering Research Branch, A.R.S., U.S.D.A., and Agricultural Engineering Dept., Minnesota Agricultural Experiment Station.) (Paper No. 3688, Scientific Journal Series, Minn. Agr. Exp. Sta.)

A study of methods of application for applying post-emergence herbicides to soybeans. Larson, R. E. A study was set up to determine the effectiveness of three methods of application as a means of improving the tolerance of soybeans to post-emergence herbicides applied at layby time. The three methods were boom mounting, drop pipes, and drop pipes with shields. The boom mounting was equipped with one 8004 nozzle centered between each two rows and adjusted in height such that it would spray only the uncovered area between the rows. The drop pipe mounting

consisted of one drop pipe between rows equipped with a Whirljet 1/4 B1 nozzle set 8 in above ground such that the spray could cover the entire 40 in between rows unless obstructed by the lower leaves of the bean plants. The shield mounting had shields (36 in L x 24 in H) added to the drop pipe mounting and set 4 in from the center of the row, leaving an unsprayed band 8 in wide over each row and keeping all spray off the bean leaves. The chemicals and rates included in the study were 2 chloro-4, 6 - bis(ethylamino)-s-triazine 2 lb, PCP(Na) 20 lb, 2,4-D 2 lb, dalapon 4 lb, CMU 2 lb, and DNBP 7 1/2 lb. The beans were rotary hoed twice and cultivated three times prior to application of the herbicide treatments. Weeds were not a problem at time of application and because of dry weather they continued to be no problem even in the unsprayed check.

Analysis of the results show no significant differences due to the methods of application. The results show no differences in yield due to chemical except for the CMU and the dalapon treatments in which the yields were significantly lower than the unsprayed checks for all three methods of application. (Contribution of Farm Machinery Section, Agricultural Engineering Research Branch, U. S. D. A., Columbia, Missouri.)

<u>A study of the use of shields as a method of reducing dalapon injury to corn.</u> Larson, R. E., and Fletchall, O. H. Dalapon at 4 lb/A was applied as a layby treatment to corn 30 in high, using 2 nozzle arrangements with shields. In one setup 8004 type nozzles on 20 in spacing were set 20 in above the ground and positioned 10 in on either side of the rows. In the second setup 1/4 B1-1W Whirljet nozzles were mounted in drop pipes on 40 in spacing centered between rows and 8 in above the ground. Shields 36 in long by 24 in high with the lower edge set 0 in, 2 in, and 6 in from the ground were used to vary the amount of dalapon applied directly to the corn plants. The shields were set such that the leading edge was 10 in ahead of the boom. The corn had been cultivated 3 times prior to the spray application.

The drop-pipe mounting tended to produce less ear injury and higher yields than the boom mounted nozzles. There is also an indication that through the use of shields injury can be decreased if the spray can be prevented from contacting the corn plant. (Contribution of Farm Machinery Section, A.E.R.B., A.R.S., U.S.D.A., and Field Crops Department, University of Missouri, Columbia, Missouri.) (Missouri Agricultural Experiment Station, Journal Series No. 1674.)

<u>Effect of equipment factors in basal hand sprayer applications for brush control.</u> Larson, R. E. Studies were set up to determine the influence of various factors on the amount of material applied in using the compressed air hand sprayer in making basal applications for brush control. Roughness of bark, size of stem, nozzle, extension shape and length, and operator were factors included in the study. The effect of roughness of bark was observed by using hickory and oak stems as being representative of smooth and rough bark respectively. The three size classes of stem diameters were: 1 1/2 in (1 in to 2 in), 2 1/2 in (2 in to 3 in), and 3 1/2 in (3 in to 4 in). Straight extensions and extensions curved 45° were studied. Extension lengths were 24 in and 48 in. Straight and swivel nozzle mountings were used. Two operators ran all tests. There were 1600 stems per acre and all spraying was done at 30 psi with water as the spray material.

The results show that as stem size increased from 1 1/2 in to 3 1/2 in the amount of material used increased from 9 gal to 16 gal/1000 stems. The rough bark (oak) stems averaged 12% more material than did the smooth (hickory) stems. There was no difference in the amounts applied by the 2504 and 8004 nozzles but an adjustable cone nozzle applied 5% less material than did the other two. More material was applied with a 48 in curved extension than with the 24 in extension. There was

no consistent difference between operators in the amount of material applied. The average amount applied for all conditions was 12.21 gal/1000 stems. (Contribution of Farm Machinery Section, Agricultural Engineering Research Branch, U.S.D.A., Columbia, Missouri.)

Summary

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Basic Studies

Summary D. W. Staniforth

Major interest this year in basic studies of weeds and weed control centered on weed seed germination and weed ecology. A further report on residual action of herbicides emphasized the longevity of some herbicides and the potential danger to succeeding crops planted in treated soil.

Soybean seedlings grown from seeds soaked in 2,4-D solutions, exhibited many characteristic anatomical and histological abnormalities. The gross symptoms of these effects have undoubtedly been observed by many investigators surveying the damage done to soybeans by pre-emergence sprays of 2,4-D.

The increasing abundance in Western Canada of a weedy artemesia,

native to Europe, illustrates how many serious weed pests were spread in this country decades ago.

Production of viable seeds by weed plants before complete maturity has long been a major problem in weed control. The studies in South Dakota shed new light on this problem with Canada thistle and perennial sow thistle. The possible role of honey bees in the pollination of Canada thistle provides still another mechanism for the potential spread of this weed.

The increased interest in problems of weed-seed germination and dormancy is most encouraging. Emphasis on this phase of weed control research will aid materially in problems of practical weed control.

Losses in crop yield due to the effects of weed competition may vary greatly with environmental conditions. Distribution of rainfall over the growing season is an important factor.

The residual effect of CMU (monuron) on some cereal crops. Carder, A. C. In late May seed-beds were prepared where 20 and 40 lb./A of active CMU had been applied 4 years previously on couch turf and where complete kills of this grass had been obtained. On both areas plots of Redwing flax, Chanceller peas, Olli barley, Saunders wheat and Beaver oats were sown. The growth of these crops followed the same pattern as has been noted in former years. The first 2 weeks the crops emerged and grew normally. Shortly after this time necrosis of tissue occurred and 6 weeks after seeding no worthwhile stand remained. As with seedings of these cereals made in previous years on these plots, flax and peas exhibited most tolerance to the chemical. Many plants of these species recovered from the set-back during their early growth period and later developed normally. This behaviour was most common where the lighter rate of CMU had been applied. In any case the resultant stands were very thin. Data over the years indicate that the residual effect of the chemical is gradually dissipating. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

The increasing abundance of absinth as a weed. R. T. Coupland, G. W. Selleck, C. Frankton, and T. V. Beck. In 1954 Coupland and Zilke reported the occurrence of Artemisia absinthium as a weed in Saskatchewan. Serious infestations had been found in the Luseland-Denzil and Cypress Hills areas, while smaller infestations had been found near Allan, Elbow, Hepburn, Lanigan, Limerick, and Montreal Lake. During 1956 two more extensive infestations were recognized. These are in the Penzance-Dilke area of Saskatchewan and the Cowan-Ashville section of Manitoba. In the former area roadsides, fence lines, and farmyards are infested over an area about 20 miles long and 4 to 6 miles wide, several native grass pastures being dominated and a few fields of cereals being invaded by the weed. In the second area a heavy more or less continuous stand occurs on the highway edge, along fence lines and in farmyards for 65 miles and in some places pastures and cropland have been invaded. One 50-acre pasture is dominated by the weed. It was also found in Manitoba on both sides of Lake Manitoba along roadsides and in farmyards in patches from St. Rose to Langruth and from Mulvihill to the ferry at Ebb and Flo. The weed has also been found at Carmel, Frankslake, Lajord, Southey, and

Spalding in Saskatchewan. In addition to reducing the yields of pasture and crop, it is considered as a problem because it has tainted dairy products, caused grain to be rejected due to possible taint in flour, and dust from the plant has made combine operators ill. Once established in cropland the woody roots of absinth are difficult to destroy, even by ploughing. While the mature plants may reach 5 ft. in height, considerable competition is afforded by the rosettes alone which frequently number from 100 to 250 per sq. yard in badly infested native pastures. (Contributed by the Department of Plant Ecology, University of Saskatchewan with co-operation from the Canadian and Saskatchewan Departments of Agriculture.)

<u>The age of Canada thistle flowers when viable seeds were produced</u>. Derscheid, Lyle A. and R. E. Schultz. On July 17, 1956 all flowers were removed from plants in a patch of Canada thistle. On July 18, 400 heads that had opened in the intervening 24-hour period were tagged with white tags. A day later 400 additional newly opened heads were marked with red tags. An additional 300 heads were tagged with blue markers on the 3rd day. Fifty heads were harvested on the 6th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, and 19th days after they opened. These heads were dried in a corn drier. Twenty heads were threshed separately and germinated separately. Germinations are not complete, but it appears that heads 11days old or older produce a high percentage of viable seeds, but that those less than 11 days of age do not produce many viable seeds. These data are not conclusive, but they indicate that Canada thistle produces viable seed by the time the heads have been open 11 days. (Contributed by the Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota.)

<u>The age of perennial sow thistle flowers when viable seeds were produced</u>. Derscheid, Lyle A. and Kinch, R. C. In a preliminary experiment, all the flowers on a patch of perennial sow thistle were removed on July 17, 1955. The next day tags were placed on heads that had opened during the intervening 24-hour period. Twenty heads were harvested each day on the 4th, 5th, 6th, 7th, 8th, and 9th day after they opened. The heads were dried and threshed. The seed from heads harvested on a given date were bulked and 100 seeds were germinated. Seeds from heads 4 days old were 16% viable; 5 days 7%; 6 days 25%; 7 days 68%; 8 days 83%, and 9 days 83%. These data are insufficient to be conclusive, but they indicate that viable seed is formed by perennial sow thistle shortly after they flower. (Contributed by Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota.)

<u>The use of honey bees for pollinating Canada thistle</u>. Derscheid, Lyle A. and Russel L. Nash. During the summer of 1955 cuttings of Canada thistle were transplanted into a 4-ft. by 20-ft. greenhouse bench. Cuttings from staminate and pistillate plants were planted at a ratio of 1:5. When the plants started flowering during the winter, honey bees were put in the greenhouse. There was an average of 1 flowering staminate plant per square yard. When the bees were taken out, 175 pistillate heads were tagged and allowed to mature. They produced an average of 43.5 mature seeds per head. Later a large fan wasused to blow air across a new crop of heads that had 3 staminate heads per square yard. 100 pistillate heads were tagged and the

fan was used for daily for 2 weeks. After the pistillate heads had matured, they were threshed. They produced an average of 0.76 mature seeds per head. The bees were then returned to the greenhouse and the thistles produced mature seeds again. Ten plants were cross-pollinated by hand and they produced an average of 68.5 seeds per head. These data indicate that bees and perhaps other insects can cross-pollinate Canada thistles and that wind may not cause much cross-polination. (Contributed by Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota.)

<u>Factors</u> <u>affecting</u> <u>germination</u> <u>of</u> <u>perennial</u> <u>sow</u> <u>thistle</u>. Derscheid, Lyle A. and S. Zilke. During the summer of 1956 several methods were used to determine the best method of securing a high percentage of germination of perennial sow thistle seeds. The data are presented in the following table:

Treatments*	% Germ.	No. of seeds tested	Days for max. Germ.**	Days for 70% Germ.
1. Light	81	300	37	14
2. Light 4 days; cold 7 days; dark	82	400	32	12
3. Dark	78	300	28	25
4. Cold 7 days; light	74	700	35	32
5. Cold 7 days; light 3 days; dark	85	200	35	14
6. Cold 7 days; dark 5 days; light 3 days; dark	44	300	57	--
7. Cold 14 days; dark	20	300	51	--

*Light is at alternating temperatures of 86°F for 9 hrs. and 68°F for 15 hours with light during the 9-hour period. Dark is at alternating temperature of 86°F and 68°F. Cold is at 48°F.

**Days required for the last seed to germinate - all were left in germinator for approximately 10 weeks.

Several methods appeared to be equally satisfactory, however, those that had a light period and a cold period in sequence gave somewhat higher germination percentages. Three days of light or 7 days of cold appear to be sufficient. (Contributed by the Agronomy Department of South Dakota State College, College Station, Brookings, South Dakota.)

<u>Factors</u> <u>affecting</u> <u>the</u> <u>germination</u> <u>of</u> <u>Canada</u> <u>thistle</u> <u>seeds</u>. Derscheid, Lyle A. and S. Zilke. During the summer of 1956 several methods were used in the seed laboratory to determine the best method of securing a high percentage of germination of Canada thistle seeds. The data are presented in the following table.

Treatments*	% Germ.	No. of seeds tested	Days for max. Germ.**	Days for 70% Germ.
1. Light	53	600	55	--

2. Light 2 days; cold 7 days; light	54	400	49	--
3. Light 2 days; cold 7 days; dark	48	400	49	--
4. Light 4 days; cold 7 days; light	85	400	32	12
5. Light 4 days; cold 7 days; dark	82	300	32	12
6. Light 4 days; cold	82	300	32	15
7. Dark	52	600	55	--
8. Cold	30	400	49	--
9. Cold 7 days; light	84	400	56	32
10. Cold 7 days; dark	58	300	41	--
11. Cold 14 days; light	27	300	52	--
12. Cold 18 days; dark	62	300	46	--

*Light is at alternating temperatures of 9 hrs. at 86°F and 15 hrs. at 68°F with light during 9-hr. period. Dark is at alternating temperature of 86° and 68°. Cold isat temperature of 48°F.

**The number of days required to get last seed to germinate -- all were in germinator for approximately 10 weeks.

These data indicate that a period of light and aperiod of cold are necessary to get quick germination. The period of light should be longer than 2 days. It apparently makes little difference whether the light or cold is used first, however, the use of a light period ahead of the cold period seems to speed up the process. If the cold period is used first it should be less than 14 days in length. Treatment No. 5 is being used as a regular procedure because the equipment on hand accommodates this procedure more easily. Several thousand seeds have been germinated with this procedure with very satisfactory results. (Contributed by the Agronomy Department of South Dakota State College, College Station, Brookings, South Dakota.)

<u>The effects of 2,4-D on radicle development and stem anatomy of soybean</u>. Rojas-G, M. and Kommedahl, T. Soybean seeds were immersed in 2,4-D, at 100 ppm, for 1 hour, rinsed in water for 15 minutes, and allowed to germinate for 85 hours in Petri plates. Control seeds were immersed in water for 1 hour; some were then germinated over a 40-hour period, i.e., until radicles attained the lengths of treated seed, and others were germinated for 85 hours. Plants in the third trifoliate stage were sprayed in the field with 2,4-D at 1 lb./A. After 15 days stems were sectioned. <u>Results</u>: For radicles of comparable sizes, treated radicles had almost twice as many cells as non-treated ones, which might be expected as treated ones were 45 hours older. However, cells were on the average 58% smaller than non-treated ones. Upon comparing radicles of the same age but of different size, it was found that the rate of elongation was inhibited 75% by 2,4-D and the rate of mitosis by 28%. Thus the principal inhibitory effect was on cell elongation. When 2,4-D sprayed stems were examined histologically, the major changes observed were: disappearance of chloroplasts from cortical cells, root initiation from the endodermis, and proliferation of phloem parenchyma that crowded, even crushed, cortical cells. (Department of Plant Pathology and Botany, University of Minnesota, St. Paul, Minnesota. Paper No. 3648, Scientific Journal Series, Minnesota Agricultural Experiment Station.)

<u>Laboratory tests for determining weed seed viability</u>. Steinbauer, G. P. and Buford Grigsby. In a continuation of the program

previously reported (Steinbauer, Grigsby, Correa, and Frank, Proc. Assoc. Off. Seed Anal. 45: 48-52. 1955), seeds of 54 species of weedy plants in 15 families were tested under a variety of temperatures, substrates, moistening agents, and other treatments to determine the most effective requirements for the germination of dormant and non-dormant weed seeds. Satisfactory methods (yielding 90 or over per cent germination for cleaned, sound seeds) were developed for 47 of the species. Seeds of eight of the species did not germinate satisfactorily by the methods tried and call for further experimentation. The seeds used in the 1955-56 experiments are listed below:

Acalypha virginica *	Euphorbia maculata	Potentilla recta
Achillea millefolium	Euphorbia supina	Prunella vulgaris
Acnida altissima *	Geum virginianum	Rudbeckia hirta
Amaranthus albus	Hieracium longipilum	Rumex acetosella *
Amaranthus graecizans *	Hypericum perforatum	Rumex altissimus
Amaranthus hybridus	Inula helenium	Rumex crispus
Amaranthus retroflexus	Lactuca scariola	Rumex obtusifolius
Arctium minus	Malva rotundifolia *	Silene antirrhina
Bromus secalinus	Mollugo verticillata *	Sonchus arvensis
Bromus tectorum	Oenothera biennis	Sonchus asper
Centaurea maculosa	Phytolacca americana	Sonchus oleraceus
Chenopodium hybridum *	Plantago aristata	Taraxacum officinale
Cichorium intybus	Plantago lanceolata	Tragopon pratensis
Chrysanthemum leucanthemum	Plantago major	Verbascum blattaria
Cirsium arvense	Plantago rugelli	Verbascum thapsus
Cirsium vulgare	Plantago virginica	Verbena hastata
Dipsacus sylvestris	Potentilla norvegica	Veronica peregrina
Dracocephalum parviflorum	Lactuca canadensis	

* Require further experimentation.

The methods found most effective for testing the germinability of the above seeds are being repeated on the current (1956) collections, after which the details of methods are to be published. (Contribution of the Mich. State Agr. Expt. Sta., E. Lansing, Michigan.)

Dormancy, germination, and flowering habit of Bromus secalinus and Bromus tectorum. Steinbauer, G. P. and Buford Grigsby. Seeds of Bromus secalinus and Bromus tectorum, tested for germination immediately after harvest, required a temperature of approximately 15°C for germination. After 4-6 weeks of dry storage the temperature requirement changed so that the seeds germinated well at either constant 15°C, 20°C, 25°C, or alternating 15°-30°C, or 20-30°C. Fresh seeds germinated at the higher temperatures if prechilled for 1 week in the moist condition at 5°C. Recommended test procedure: Seeds on top of 2 blotters in petri dish, water, 15°C; or 1 wk. prechill, then 20°C or 25°C. Seeds stored dry for 4-6 wks. do not need low temperature or prechill. Seeds not light requiring.

Seeds planted in the field in the fall germinated almost 100% at depths of 3 inches, 1 inch, and just covered on the surface. Seedlings started in the fall flowered freely the following summer. Seeds planted at 2 week intervals in the spring, starting April 20, germinated and vegetated the same season, but did not flower till one year later.

Germination tests on seeds stored dry in closed jars in the laboratory indicate a longevity of the seeds of both species of at least 8 years. (Mich. State Agr. Expt. Sta., E. Lansing, Mich.)

Plant competition studies with soybeans and Setaria spp. under varying rainfall conditions. Staniforth, D. W. Infestations of yellow and green foxtail (Setaria lutescens and S. viridis) were established in rows of soybeans, planted 40 inches apart. Stand of beans averaged 9-10 plants per foot of row; foxtail infestations were thinned at early seedling stage, to 24 plants per foot of row. Natural rainfall and irrigation water were utilized to give varying patterns of rainfall distribution. Strips of sisal-kraft paper were laid between rows to run off natural rainfall when desired. Four general patterns of seasonal rainfall distribution were obtained: 1. Soil at or near field capacity for entire season. 2. Soil mostly below field capacity over season, 3. Soil moisture high to early July, then dry for rest of season, 4. Soil dry to early July, then wet for rest of season. Yields of seed beans and yields of weeds were obtained. Data for the seasons of 1955 and 1956 are reported. Results: With adequate soil moisture over the whole season weed growth was moderately heavy and the percentage bean yield reduction due to weed competition averaged 4-6 per cent. When soil moisture was essentially limiting over the entire season, or until early July, weed growth was reduced and bean yield reductions averaged 4-6 per cent. When soil moisture was adequate to early July and then dry for rest of the season, weed growth was similar to that in treatment 1, but bean yield reductions averaged 12-15 per cent. (Contribution from Department of Botany and Plant Pathology, Iowa Agricultural Experiment Station, Ames, Iowa.)

Miscellaneous

Abstracts

Weeds in irrigation ditches

Effectiveness of several chemicals for controlling annual weeds on irrigation ditches. Derscheid, Lyle A. Wettable powders of monuron, diuron, fenuron, neburon and DCU were applied at rates of 5, 10 and 15 lb./A. active ingredient. Erbon was applied at 15 and 20 lb./A., dalapon at 5 and 10 lb./A. and ATA at 5, 10 and 15 lb./A. on 9-ft. x 30-ft. plots. Ureabor and Chlorea were applied at 2 and 4 lb./sq. rd., D B Granular at 3, 5 and 7 lb./sq. rd. and Polybor-chlorate at 5 and 10 lb./sq. rd. of actual product on 9-ft. x 15-ft. plots. All were applied on a small new ditch including the entire width of the ditch and most of the shoulders on either side on May 9 after the ditch had been used for one spring irrigation. Kochia, foxtails and wild barley were the most common weeds, but some dock and field bindweed were present. Very few had emerged when the chemicals were applied. ATA and dalapon plots were retreated June 13.

Notes were taken on June 13 and September 19. In June it appeared that all rates of monuron, diuron and fenuron had killed everything except wild barley and bindweed. All rates of Ureabor and Chlorea had killed 95% of all the weeds and the highest rate of Neburon, D B Granular and Polybor-chlorate had killed 70-75% of the weeds. By September it became apparent that both rates of Ureabor and Chlorea were the only chemicals that had given complete sterilization. All three rates of ATA and both rates of dalapon had killed all the grassy weeds but had not injured the Kochia.

These results indicate that Ureabor applied dry or Chlorea applied as a spray may be useful for sterilizing irrigation ditch banks and shoulders. They also indicate that ATA and dalapon might be useful if mixed with 2,4-D to kill broad-leaved weeds and applied more than once a year. Other research data indicate that erbon should not be expected to be effective at the rates used here. (Contributed by Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota).